

THE METAL INDUSTRY

WITH WHICH ARE INCORPORATED
THE ALUMINUM WORLD: COPPER AND BRASS: THE BRASS FOUNDER AND FINISHER
ELECTRO-PLATERS REVIEW

Vol. 24

NEW YORK, OCTOBER, 1926

No. 10

American Foundrymen's Convention

A Report of the Joint Meeting of the American Foundrymen's Association and the Institute of Metals Division, Held in Detroit, Mich., September 27-October 1, 1926

The 30th Annual Convention and exhibition of the American Foundrymen's Association was held in Detroit, Michigan, September 27th—October 1st, 1927. Together with this convention was held the second International Foundrymen's Congress which attracted about 100 visitors from foreign countries. These distinguished visitors had been met by local foundrymen's associations in New York, Philadelphia and other cities on their way to Detroit and were entertained with banquets and visits to plants.

This convention broke all records for size, occupying 83,000 square feet of floor space as compared with a

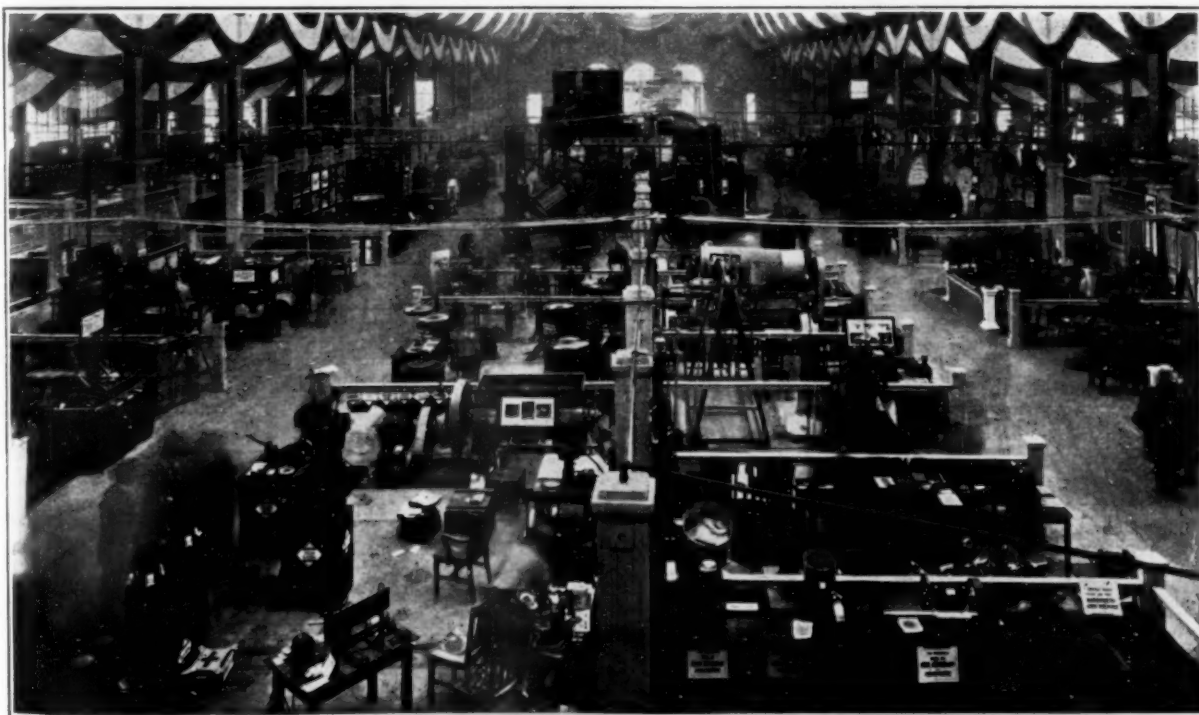
little over 57,000 square feet, the average for the past six years. The operating exhibits were set up in the Coliseum and the Dairy Building while the still exhibits were lodged in the Agricultural Building. A total of almost 6,000 visitors and members registered and 263 firms exhibited their products.

NEW OFFICERS

The new officers elected for 1926-1927 are as follows:

For President to serve for one year:

S. W. Utlej, Vice-President and General Manager,



EXHIBITS IN THE DAIRY BUILDING, MICHIGAN STATE FAIR GROUNDS, DETROIT, MICH.

Detroit Steel Casting Company, Detroit, Michigan.

For Vice President to serve for one year:

S. T. Johnston, Vice President, S. Obermayer Company, Chicago, Ill.

For Directors to serve three-year terms each:

Martin W. Henley, Vice-President, Frazer & Jones Company, Syracuse, N. Y.

N. K. B. Patch, Secretary and Works Manager, Lumen Bearing Company, Buffalo, N. Y.

A. B. Root, Jr., Mechanical Engineer, Hunt-Spiller Manufacturing Corporation, Boston, Mass.

S. C. Vessy, President, W. W. Sly Manufacturing Company, Cleveland, Ohio.

L. C. Wilson, Vice-President and General Manager, Federal Malleable Company, West Allis, Wis.

EXHIBITS

New exhibits of particular interest to the brass, bronze and aluminum foundries were as follows:

Tessmer Machine & Tool Company, Detroit, Mich. Pneumatic shaker.

Rudolf Geiger, Ravensburg, Germany. Portable sand separator and blender.

Crown Rheostat & Supply Company, Chicago, Ill. No. 49 polishing and buffing lathe.

Wm. H. Nicholls Company, Inc., Brooklyn, N. Y. Jolt squeezers adapted for brass foundries.

Berkshire Manufacturing Company, Cleveland, Ohio. Model H jolt squeeze molding machine.

Bellevue Industrial Furnace Company, Detroit, Mich. Melting furnaces for brass and aluminum.

Pangborn Manufacturing Company, Hagerstown, Md. Type GF sand blast barrels for brass foundries.

American Foundry Equipment Company, Mishawaka, Ind. Core machines; aluminum taper strip flasks.

Cleveland Flux Company, Cleveland, Ohio. Brass fluxes for bronze castings, buffings, sweepings and turnings.

U. S. Industrial Engineering Company, Cleveland,

Ohio. Preheated air recuperative metal melting furnaces.

General Electric Company, Schenectady, New York. Arc welding equipment; water jacketed glue pots; enclosed motors.

Ruemelin Manufacturing Company, Minneapolis, Minn. Vacuum Type arrester; hood type sanitary sand blast machine.

Lowe Manufacturing Company, Detroit, Mich. Electric sifting machines, using the Pyramid Riddle made by Somers Brothers, Springfield, Ohio.

Wadsworth Core Machine & Equipment Company, Akron, Ohio. Core testing outfit; jolt roll-over and box lifting core machine; core testing and oven.

Taylor Instrument Companies, Rochester, New York. Tycos Thermo-pyres, high temperature portable pyrometer units ranging from 0° F. to 2200° F.

Milwaukee Foundry Equipment Company, Milwaukee, Wis. Stationary No. 281 and Portable No. 282 hand ram hand roll-over power clamping power draw molding machine.

Tabor Manufacturing Company, Philadelphia, Pa. New shockless jar squeeze flask lift machine, designed to jar and squeeze the mold and lift the cope and pattern plate automatically.

Lava Crucible Company, Pittsburgh, Pa. A wide and greatly increased line of shapes for metal melting furnaces, coal, coke, oil, gas electric fired, including furnace covers, crucible base blocks, and special lining shapes.

Osborn Manufacturing Company, Cleveland, Ohio. Number 321 jolt roll-over squeeze pattern draw molding machine; No. 81 jolt squeeze stripper molding machine; No. 177 jolt squeeze stripper molding machine.

American Electric Motors, Inc., Milwaukee, Wis. Ball-bearing enclosed self-ventilated polyphase induction motor; belt driven single arbor polishing and buffing lathe; belt driven double spindle polishing and buffing lathe.



HEAVY MACHINE EXHIBITS LOCATED IN THE AUDITORIUM, STATE FAIR GROUNDS, DETROIT, MICH.

Spencer Turbine Company, Hartford, Conn. Turbo-compressors.

H. W. Knight & Son, Seneca Falls, N. Y. Pattern letters and figures.

Allen Air Turbine Ventilator Company, Detroit, Mich. Multivane turbine ventilator.

Illinois Clay Products Company, Joliet, Ill. Plastic fire clay; fire clay flour; fire cement.

Yale & Towne Manufacturing Company, Stamford, Conn. Ball bearing electric chain hoists.

Standard Sand & Machine Company, Cleveland, Ohio. Sand mixers for core and facing sands.

Buckeye Portable Tool Company, Dayton, Ohio. Portable air tools; grinders, buffers, sanders and drills.

Detroit Electric Furnace Company, Detroit, Mich. Electric brass melting furnaces, 250 lb. and 350 lb. capacity.

Monarch Engineering & Manufacturing Company, Baltimore, Md. Automatic rocking barrel furnace for melting brass.

R. G. Haskins Company, Chicago, Ill. Portable electric machinery; flexible shaft equipment; portable tools and labor saving devices.

Arrangements for Future Conventions

It was decided by the Board of Directors of the A.F.A. that the 1927 meeting would be held some time in June. It will consist only of technical sessions; no exhibits will be shown. The meetings will be held in cities to be determined at an early date.

In 1928 a combined meeting and exhibition will again be held, this place also to be decided at a later date. The feeling of the membership is that exhibits should be held every two years instead of every year, as in the past, because of the heavy expense involved and the fact that it is rarely possible to bring out new equipment every year.

INSTITUTE OF METALS PLANS

The Institute of Metals Division was approached by the American Society for Steel Treating to cooperate with them in getting up Data Sheets for distribution to its membership. The Institute voted to appoint a committee to consider this matter and to work out some method of cooperating with the A. S. S. T. In view of the fact that the date of the meetings of the American Foundrymen's Association has been changed this committee was also empowered to take up the question of holding its meetings at such a time and place as would be convenient, and to work in conjunction with the Foundrymen's Association the Steel Treating and the Society for Testing Materials.

At the annual dinner of the Institute of Metals Division Secretary Corse reported that the membership totalled about 800 and that the finances of the Institute were in good condition.

Dr. W. Guertler of Charlottenburg, Germany, spoke on Developments in Non-Ferrous Alloys. Dr. Guertler's talk was one of the best ever delivered before the Institute. He traced the growth of alloys of the commercially important metals from the simple brasses and bronzes to the more complex forms in use today. He also pointed out fields for future work.

A message of sympathy and condolence was sent to the family and friends of George K. Elliott, past chairman of the Division, who died September 22nd.

THE ANNUAL BANQUET

The annual banquet was noteworthy this year because of the speaker, Chas. F. Kettering, vice-president and general director of the research laboratories of the Gen-

eral Motors Corporation, and the presentation of three of the A. F. A. gold medals to E. V. Ronceray, John Shaw and Thomas Turner.

This banquet was held Thursday evening, September 30th, at the Hotel Statler.

MOLDING SAND TESTING DEMONSTRATION

The molding sand demonstration was sponsored by the joint committee on molding sand research and the foundry sand testing apparatus on display was approved as tentative standard by the joint committee or recommended to the attention of the foundrymen as special plant control apparatus, considered of practical value. The properties that can be determined by the use of this apparatus are strength or bond, permeability and degree of fineness. This equipment was loaned by the Bureau of Standards, Cornell University, Reynolds Electric Company, John Ehny & Son and W. S. Tyler & Company.

APPRENTICE MOLDING CONTEST

The iron castings on display in this booth were those which were made in apprentice molding contests held in various sections of the country, and which were judged by committees to be the best submitted in these local contests. An A. F. A. committee of judges selected from among those displayed those which they considered to be best in this national contest, and prizes were given to the winners.

The contest was held under the auspices of the American Foundrymen's Association Apprentice Training Committee. Reports of apprentice training work were discussed at the Training Session Tuesday, September 28th.

GERMAN APPRENTICE DISPLAY

The German Foundry Association showed material which is used in apprentice training courses in certain of the German plants. The display was in charge of John Mehrtens, who represented the Deutscher Eisengiesereien (German Foundries Association) of Dusseldorf, Germany.

JOINT COMMITTEE ON FOUNDRY REFRACTORIES

The joint committee on foundry refractories organized by the American Foundrymen's Association and the American Ceramic Society, and with representation of eleven national organizations in its endeavor to show the need for simplification of the number of refractories shapes, which are used for similar purposes, is displaying examples of the excessive variations of commonly used malleable and steel foundry refractories. Chart of data of non-ferrous foundry refractories are also displayed.

REFRACTORIES IN THE METAL FOUNDRY

A preliminary report on refractories in the non-ferrous foundry was presented by H. M. St. John, chairman of the sub-committee for this industry. It covered 83 foundries which answered a questionnaire. This report will be reported in a later issue of THE METAL INDUSTRY.

UNIVERSITY OF MICHIGAN CORE OIL INVESTIGATION

The equipment on display in this booth was used at the University of Michigan by the Division of Engineering Research in investigating the properties of core oils. The results of this investigation were given in a paper presented at the Syracuse meeting of the A. F. A. in October 1925 with further findings presented at this meeting.

FRENCH FOUNDRY SCHOOL DISPLAY

The display in this booth illustrated the extent to which a special school for advanced training of foundry workers has progressed under the supervision of E. V. Ronceray

a member of this association from France. Mr. Ronce-ray, the founder of this school, was present.

FOUNDRY COST DISCUSSION *

The session on foundry cost which was held under the auspices of the cost committee was one of the principal features. The committee has secured E. W. McCullough, and R. E. Belt to give the principal addresses for this meeting. Mr. McCullough, the manager of department of manufacturing, of the United States Chamber of Commerce, has had life time training in dealing with manufacturing and problems of cost accounting. R. E. Belt, secretary of the American Malleable Castings Association is one of the prominent cost consultants of the foundry industry. The cost committee report which was

presented at this meeting contained the principal elements of foundry cost accounting systems.

To emphasize the need for more information regarding foundry costs and to draw attention to the great amount of guess work employed in obtaining foundry cost, the committee conducted an estimating contest in connection with its exhibit booth. The estimating contest provided for the estimating of production of quantity and weights of castings to be produced from patterns which were on display. There was pattern equipment from commercial foundries representing the steel, gray iron, malleable brass and aluminum foundries. Prizes were provided for the winners in each section in this contest. In the exhibit booth the committee also had on display information regarding cost accounting methods.

RESULTS OF WEIGHT GUESSING CONTEST

Prize	Actual Weight lbs.	Guess lbs.	Kind of Casting	Winner	
1st Prize	Writing Set..... 20	20	Malleable	C. P. Ziegler	Grand Rapids Fdy., Grand Rapids, Mich.
2nd Prize	Gladstone Bag.. 38½	38	Brass	John Caswell	Chamberlain Co., Los Angeles, Calif.
3rd Prize	Traveling Bag.. 200½	200	Gray Iron	Leonard Pitt	Carborundum Co., Niagara Falls, N. Y.
4th Prize	Two Umbrellas. 143½	144	Steel	E. G. Weghorst	Simons Paint Spray Brush Co., Dayton, Ohio
5th Prize	Mantel Clock... 6.2 (100 oz.)	6 3 oz. (99 oz.)	Aluminum	A. P. Grimm	A. P. Grim Fdy. Co., Bound Brook, N. J.

Tie on Malleable Casting five guessed weight of 20 lbs. Winner chosen by drawing.

Those guessing 20 lb. besides the winner:

Alfred Simon, Crunstadt, Germany.

J. Prendergast, Sullivan Machine Company, Claremont, N. H.

Fred A. Cowen, Warner R. Thompson Company, Detroit, Mich.

H. W. Clark, H. W. Clark Company, Mattoon, Ill.

Two guessed 38 lbs. on Brass Casting. The winner was drawn.

The other guess was made by George C. Johnson, Johnson Foundry, Los Angeles, Calif.

Range of guesses:

Malleable 4½ to 47 lbs.

Brass 7 to 85 lbs.

Gray Iron 28 to 382 lbs.

Steel 78 to 319 lbs.

Aluminum 1¼ to 60 lbs.

Abstracts of Papers on Metals

CONSTITUTION OF ALLOYS OF ALUMINUM, ZINC AND TIN AND ALUMINUM, ZINC AND CADMIUM

By V. JARES, PRAGUE, CZECHO-SLOVAKIA

1. By thermal analysis and dilatometric measurements the exact temperature of decomposition of phase β in the binary system Al-Zn has been determined. It confirms the results of Isihara according to whom this temperature is about 280° C.

2. With the help of thermal analysis and microscopical observation the constitution of the ternary alloys Al-Zn-Sn and Al-Zn-Cd has been determined. Both have shown an interesting fact, namely that the phase β formed during crystallization decomposes again before its completion.

ALUMINUM-ALLOY PERMANENT-MOLD CASTINGS

By DR. ROBERT J. ANDERSON

A permanent mold casting is defined as a semi-finished (or it may be practically finished) casting made by pouring a liquid alloy into a metal (usually cast iron) mould, the alloy entering the mold under the force of gravity solely. One object of this paper is to indicate to foundrymen the directions which have been taken by the more recent developments in aluminum-alloy permanent-mold casting, and to present such information, and to indicate where additional information will be found, as well assist them in taking up the production of castings by the permanent-mold process. Another object of this paper is to discuss briefly the properties, mode of manufacture, and fields of application of aluminum-alloy permanent-mold castings to give comparison with sand castings and die castings, thus assisting the consumer of castings in mak-

ing a judicious choice of the correct kind of castings for specific purposes.

Comparison is made of the sand, die, and permanent-mold-casting methods for producing aluminum-alloy castings, and the characteristics of the products obtained by these three methods are described. It is shown that aluminum-alloy permanent-mold castings have greater soundness finer grain size, greater strength and hardness, greater resistance to impact and alternating-fatigue stresses, and greater resistance to corrosion than sand castings. The general and specific fields of application for permanent-mold castings are discussed. The kinds of alloys used for casting in permanent molds are taken up, and the mechanical properties of permanent-mold-cast alloys are compared with sand-cast alloys. Brief details are given of the permanent-mold process, and the questions of mold design and methods of gating are taken up. The sizes and weights of castings being made by the permanent-mold process are indicated, and the question of casting tolerances is discussed. Finally, the occurrence of defects in castings and methods for the elimination of wasters in production are described.

DISCUSSION

This paper was read by S. Tour in the absence of Dr. Anderson. In the subsequent discussion Mr. Tour questioned the author's conclusions about the relative strength of die-castings and permanent mold castings, stating that for the same mixtures, and with equal wall thicknesses the normal die-casting would show a tensile strength of 3,000 to 4,000 pounds per square inch more than normal permanent mold castings.

R. S. Archer stated that if feeding methods and the operation of the mold could be perfected, permanent mold castings would always be better than sand castings, but that as these conditions were subject to difficulties, it was impossible to generalize.

ALUMINUM CASTINGS OF HIGH STRENGTH

By ROBERT S. ARCHER AND DR. ZAY JEFFRIES

This paper was a review of the best methods in practice of obtaining aluminum alloys of high strength and toughness. Mr. Archer, who read the paper, traced the development of aluminum alloys from the early aluminum-zinc mixtures, which gave considerable trouble due to brittleness, to the latest aluminum-silicon alloys. He pointed out that many of these difficulties had been caused by the presence of tin and the fact that the zinc content ran over 15%.

The addition of small amounts of copper was found to be beneficial and later the No. 12 alloy containing 8% copper and 92% aluminum became practically standard.

Iron up to about 1.25% was found to increase the tensile strength of aluminum alloys but it also increased their brittleness. It seems that the aluminum-zinc-copper-iron alloys are particularly promising. The present composition is about 11% zinc, 2.5% copper, 1.5% iron and the balance aluminum, which gives tensile strengths of 25,000 to 34,000 pounds and elongations of 3 to 6%.

The silicon alloys, first brought out by A. Pacz, are made in mixtures containing up to 13% silicon. These alloys give tensile strengths of 24,000 to 31,000 pounds and elongations of 5 to 15%. It has excellent castings properties and the physical properties can be improved by proper heat treatment.

Mr. Archer described the constitution of various aluminum alloys and their metallography, discussing heat treatment, the effects of copper, iron, magnesium and the various methods of casting, temperature control, etc.

DISCUSSION

Considerable discussion ensued after this paper. Dr. Guertler discussed the properties of aluminum-zinc alloys showing that it was impossible to generalize or to make definite assertions without knowing the specific mixture, the dimensions and uses of the casting, the foundry practice followed, etc.

Mr. Ronceray asked about methods of preventing leaky castings. Mr. Archer answered that there was no cure-all for this trouble. It might be caused by dissolved gases, faulty melting or casting practice, over-heating or a number of other reasons. He did not recommend fluxes.

EQUILIBRIUM RELATIONS IN ALUMINUM-COPPER ALLOYS OF HIGH PURITY

By E. H. DIX AND H. H. RICHARDSON

Mr. Dix described his experiments in developing a thermal equilibrium diagram of the aluminum-copper alloys using materials of the highest purity obtainable. He described the preparation of the alloys; cooling curves; thermal treatment for solid solubility; annealing methods; metallographic investigation; the compound CuAl_2 ; the modified diagram; the eutectic horizontal; the solidus curve; first evidence of melting; interesting results of the investigation; structure of a pure aluminum-copper alloy; hardness values; precipitation theory; slip interference theory; effect of impurities in aluminum.

TEMPERATURE CONTROL IN ALUMINUM FOUNDRIES

By KIRTLAND MARSH

This paper was prepared to show why close control of the melting and pouring temperature in an aluminum foundry

is so essential and what results may be expected of good pyrometric equipment properly installed, maintained and used. The make of instrument to be used must be decided by the purchaser and there is a wide field from which to make a selection. The manufacturer will furnish the complete equipment and full instructions for the proper installation of the same. Detailed descriptions of a few special features such as the asbestos insulated quick reading couples, the special wiring diagram of an indicating pyrometer installation, pyrometer tube and holder, etc., were included and if anyone desires to incorporate any of these features in an installation they are at liberty to do so, but will probably have to undertake this themselves because, in so far as the author knows, no manufacturer regularly furnishes them.

PYROMETER CONTROL IN A BRASS FOUNDRY

By ANDREW S. HALL

A modified thermo-couple was described which makes it possible to quickly and accurately measure the interior temperature of the metal in a ladle. It can be successfully used in the brass foundry with unskilled help on temperatures up to 2300° F.

DISCUSSION

During the discussion R. R. Clarke stated that in his experience and observation ninety per cent of the metal temperatures judged by eye in the foundry were gauged on color. Brightness was a factor but not very trustworthy. The pyrometer was an excellent aid but only an aid to the skilled foundryman and could not replace experience and judgment.

H. M. St. John stated that the pyrometer should be in skilled hands or its indications could be badly misinterpreted. It should be checked by the intelligence and experience of the capable foundry operator.

EXUDATIONS ON BRASS AND BRONZE

By W. B. PRICE AND A. J. PHILLIPS

At the New York meeting of the American Institute of Mining and Metallurgical Engineers held in February, 1926, W. H. Bassett and J. C. Bradley presented a paper entitled "Exudations on Copper Castings." The purpose of the present paper, as the title suggests, was to call attention to somewhat similar phenomena which the authors encountered in brass and bronze. From a study of the examples given, a more-or-less speculative theory of "inverse segregation" was advanced.

The theory of inverse segregation which it was believed that the above evidence confirms is essentially that put forth by Kuhnelt. Iokibe suggests that "there is reason to believe that the term 'inverse segregation' is used in a loose or general sense, so that it may include results arising from more than one cause." The authors used the term in a general sense inasmuch as in no instance did they find evidence of inversed freezing of the crystals themselves, that is, an inverse coring such as Masing's theory would explain. They found merely an inversion of the average composition of outside layers of bars as compared to the centers and, to their knowledge, no one has even conclusively proven that inversed coring does exist.

It is well known that Admiralty bars manifest inverse segregation. Consequently, when the exudations on bars of this alloy were encountered it seemed that this was probably a condition of exaggerated inverse segregation and the theory which explained their formation would also explain inverse segregation. Therefore, they outlined the theory of inverse segregation as follows:

1. When solidification first takes place a crystalline envelope is formed surrounding the molten metal.

2. This envelope, by shrinkage due to cooling, subjects the interior liquid to a hydrostatic pressure.

3. The shrinkage also causes the metal to contract slightly from the mold wall (which is aided by the expansion of the mold itself).

4. When the hydrostatic pressure of the melt is greater than the tensile strength of the crystalline envelope—which is quite small at the temperature—rupture takes place by intercrystalline cracking.

5. The cracks thus formed are filled by exudations of liquid metal from the interior. These almost instantaneously weld the metallic envelope into a tight container. Hence, the process of "cracking" and "welding" does not necessarily take place at the same time all over a bar, but may progress more or less continuously from one place to another.

DEVELOPMENTS IN SILVER ALLOYS

By DR. W. GUERTLER, CHARLOTTENBURG, GERMANY

A discussion of the possible fields for new silver alloys and comparisons with sterling silver.

ROUND TABLE DISCUSSION ON BRASS FOUNDRY TOPICS

At the round table on brass foundry topics a paper was read by W. F. Roeser and C. O. Fairchild of the Bureau of Standards, Washington, D. C. This paper presented a survey of the use of pyrometers in a number of brass foundries in the United States. The paper had not been pre-printed but will be published later and will appear in full or in abstract in THE METAL INDUSTRY.

A number of topics were taken up later in the session and discussed at considerable length. These topics are enumerated below.

NICKEL IN BRASSES

Opinions differed somewhat on the value of nickel in brasses. Some spoke well of it in the 85-5-5-5 mixture while others claimed to have noticed no decrease in leaky castings when using nickel.

ALUMINUM BRONZE SCRAP

One of the members asked if there was any known method of discerning aluminum bronze by its fracture or general outward appearance when mixed in with the tin bronzes. He had had the experience of receiving lots of tin bronzes containing pieces of aluminum bronze, which could not be distinguished and consequently got into the melt, ruining the metal because of the aluminum content. No one was able to help him, however. The only thing to do under the circumstances was to pig the metal, oxidize out the aluminum with air or copper scale, remove the slag and skimmings and then deoxidize the metal to make it fit for use.

HIGH LEAD MIXTURES

A great deal of discussion centered about high lead brasses and bronzes. One of the members gave his experience that the presence of lead specks up to $\frac{1}{4}$ inch in diameter in photomicrographs of 100 diameters was not at all objectionable. He had obtained tensile strengths of 30,000 to 40,000 lbs. on such pieces.

Another statement was made that even if the lead was properly stirred into the melt it could very easily be squeezed out during the process of solidification of the casting. Tin is a good factor to keep the lead disseminated; better than nickel in many cases. In a general way the greatest trouble with high lead castings is in appearance and seeming segregation, rather than physical properties, the last being generally very good.

A suggestion was made that the nickel should not be used in such castings to the extent of over $\frac{1}{2}\%$, and that phosphorus should not be used as a deoxidizer in alloys containing more than 10% lead. The use of arsenic for

holding up the lead was not recommended, and although tin is very good, more than 7% will cause trouble.

Sulphur or plaster of paris which contains a considerable quantity of sulphur is very useful in holding the lead. Nickel is also good when no zinc is present in the mixture. Sulphur can be used very well with the 50-copper, 50-lead mixture but not with alloys containing tin. Small amounts of tin or antimony (.1% or less) will result in hard backs in 50-50 rings.

An unusual suggestion was made to the effect that if the lead was treated with hydrogen before alloying, segregation would be avoided. This was corroborated by another member present.

FLUXES AND DEOXIDIZERS

The general consensus of the meeting seemed to be that if good metal was used no flux was necessary. Charcoal should be used as a cover. It is not necessary to use virgin metal, as good clean scraps are fully as serviceable, if properly melted. If borings or turnings are used, the oil should be burned off in an oxidizing atmosphere so that no carbon will get into the metal. Borax can be used as a cover and if a little sand or broken glass is added it can be skimmed without difficulty.

Magnesium was not recommended for red brass but small amounts of it can be used advantageously with manganese bronze, copper and nickel.

STRENGTH TESTS OF FOUNDRY SANDS

By T. C. ADAMS

This paper, which treats on strength tests of foundry sands, was written to satisfy needs for a general discussion of this subject and comprehensive instructions regarding the methods used to carry out foundry sand tests which have arisen through the rapid adoption of strength tests by foundries located everywhere in this country. In the first part of the paper the relation of strength tests to other foundry sand tests, the value of strength tests, principals to be observed in formulating standard strength tests, and the different problems encountered in strength testing were discussed. In commenting on the value of strength tests attention was paid to the varied problems connected with the economical preparation and the perfection of sands, molds and cores which are constantly arising in foundries.

The second part of the paper was devoted to a description of the different methods and apparatus for making strength tests of foundry sands. The tests treated were tensile, compressive, and transverse tests (also shearing tests in one instance) of molding, core, or other foundry sands. It is expected that this part of the paper may be used as a reference by any one interested in foundry sand testing and to which he may turn to find suggestions as to how strength tests which interest him may be carried out. The arrangement of the second part of the paper was to discuss under the heading of the test all apparatus known to the writer which are capable of accomplishing this test and how the apparatus are used.

THE EFFECT OF MULLING ON THE PHYSICAL PROPERTIES OF FOUNDRY SANDS

By A. V. LEUN

In the great majority of cases, increasing the time of mulling the sand will increase the permeability of the sand.

With increased mulling the tensile and compressive strength of the sand will increase. Generally, the tensile strength will increase more rapidly with respect to the initial strength than the compressive strength.

The coarseness of the sand and the clay content will not vary to any great extent with prolonged mulling. However, if the sand is mulled too dry the decrease in fine

material and clay will be more noticeable than when sufficient water is added to the sand.

It is more advantageous to mull the sand when the water content is slightly less than the optimum one. The sand should not be mulled when it is too wet.

With a fine sand, containing 15% or more of clay, the sand should be mulled drier than a coarser sand of any clay content, not exceeding a workable amount of the colloidal substance. If such a fine sand is mulled too wet the sand will be ruined if the mulling is allowed to continue for more than ten or twenty minutes.

When synthetic sands are employed in a foundry the muller should be an indispensable piece of apparatus. It is the most efficient and rapid means of producing a good uniform mixture of the different sands employed.

Every foundry, if it is able to, should have a battery of mullers, and if possible I would suggest that the floors where the most difficult work is done be put through the muller at least once every week or two weeks. New sand and also waste sand could be added to the heaps in this manner. This could be done at night when the night gang is cleaning up. Some of the floors could be put through the muller each night.

THE GRADING OF MOLDING SANDS

By C. A. HANSEN

The character of the distribution of grain sizes in molding sands was analyzed and described. A simple method of determining the average fineness of grain was proposed as a basis for grading sands in respect to fineness of grain. The relation between this proposed fineness scale and the grade numbers assigned by commercial sand producers in the Albany district was analyzed. The relations between fineness of grain, as determined by the proposed method, and various physical properties of sand were discussed, with particular reference to establishing an acceptable basis for the selection of sands for typical classes of foundry work.

METALLURGICAL CONTROL OF FOUNDRY SANDS

By L. B. THOMAS

The author first discussed the composition of molding sand, giving a brief outline of the chemical and physical properties. Next in line are the five characteristics, namely, bond (clay), permeability, fineness, durability and refractoriness, of molding sands. These are interesting because they are directly related to the workability of the sand and the quality of mold which it can produce. The temperature of the metal was discussed, thus, showing how the higher temperatures will destroy the bonding property of molding sand, finally becoming like ashes. A simple method of grading sands by the fineness test was described by the author. Shop tests to determine the durability and refractoriness of molding sands in conjunction with laboratory tests were also described.

SOME EXPERIMENTS ON THE REFRACTORINESS OF FOUNDRY SANDS

By D. W. TRAINER, JR.

Molding sands vary in their refractoriness and since the grain of the material is probably usually silica, which of itself is quite refractory, it follows that the fusion point may be controlled in a large measure by the nature and amount of the bonding material. Sands having the same amount of clay substance may have a different refractoriness and these differences must be explained as due either to difference in texture or difference in composition of the bond, assuming, of course, that both sands have been fired in the same atmosphere. In the first series of experiments described in this paper, two fixed factors were the clay and the sand, while the percentage of clay added to the

sand was varied. The mixtures were made into cones and fired in a muffle. The results of this test were given. In the next series of tests, bars of the different sand clay mixtures were made and, while supported at each end, were fired. The degree of fusion was shown by the bending of the bars. Further tests were made of natural molding sands and the writers concluded, from the results of the test, that two distinct heat properties of the sands should be recognized. These are, first, incipient fusion and, second, complete fusion. In general, the fusion point of a sand appears to be determined by the fusing point of the bond. While in general, also, molding sands appear to fuse in the order of their clay content, there are not a few exceptions which are evidently due to variations in the refractoriness of the different bonding material. The size of the grains and the presence of impure films on them exert some effect but are of secondary importance.

SUMMARY OF METHOD FOR GRADING FOUNDRY SANDS AS TO GRAIN FINENESS AND CLAY CONTENT SUBMITTED BY THE JOINT COMMITTEE ON MOLDING SAND RESEARCH

By A. A. GRUBB

An outline of the method was submitted by the Joint Committee on Molding Sand Research to the American Foundrymen's Association, for grading sands with respect to grain fineness and clay content.

ELIMINATION OF WASTE IN THE FOUNDRY

Reports were submitted by committees on the Corrosion of Metals and Pattern Equipment Standardization. The general committee and three subcommittees on pattern equipment standardization have held one joint meeting during the year. A second meeting has been held during this convention. The color chart issued by this committee during the year has been especially well received. Many plants and organizations are adopting the approved color scheme as their standard. The subcommittee on pattern-making and pattern-mounting have made recommendations in the form of "good recommended practice."

SAVING IN FOUNDRY HANDLING WITH THE ELECTRIC INDUSTRIAL TRUCK

By H. J. PAYNE

Many standard types of materials handling equipment have a legitimate field of application in the foundry. Each in its place is best. While this paper was concerned primarily with the performance and operation of the industrial electric truck, it was not maintained that this equipment is a panacea for all material handling problems encountered in the foundry. Such a contention would discount the very real merits of the storage battery and truck tractor in this type of service. Sand, pig, scrap, cores, flasks, molten metal, semi-finished castings, annealing pots and finished castings, together with waste can, however, be handled effectively with the industrial truck in most cases. The practice of the Erie Malleable Iron Company was described in detail, and since this concern has made effective use of this equipment in handling all of these materials, the manner of successful application of the equipment was clearly defined. Reference was made particularly to the performance of the pot charging truck and to the higher capacity lift truck units now coming into extensive service. The use of auxiliaries, such as special skids, scales, forks for converting standard elevating platform equipment to pot handling trucks, was brought out. The point was made that the life of this equipment, properly maintained, runs to twelve years or more; that the total cost of operation does not exceed \$5.00 in ordinary foundry service; that the average per man increase in capacity obtained through its use runs from 5 to 15 times.

FOUNDRY INSTRUCTION IN TECHNICAL SCHOOLS

Foundry Instruction at Carnegie Institute of Technology, Purdue University, University of Michigan and University of Illinois is discussed. Purpose of courses are given and details of instruction are listed. These papers are to be taken up at the meeting of foundry and shop instructors to be held at the Detroit meeting, which will be the second annual meeting of foundry instructors held in connection with the annual convention of the American Foundrymen's Association.

HANDLING MATERIALS IN A FOUNDRY

By E. T. BENNINGTON

All material handling machinery manufacturers and a great many foundrymen agree upon the fact that the handling of material in a foundry can be greatly improved upon. This paper offers two suggestions as to how this improvement can be brought about. First, by so installing the material handling machinery that the handling operation will be eliminated, or combined into one handling

operation, and second, by increasing the size of the unit of production or increasing the size of the ladle, the size of the flask and the size of the load which is carried to the cleaning room. It is maintained that with the proper installation of material handling machinery a large load can be handled just as conveniently and with just as great speed as a smaller load can be handled by the more simple handling devices.

APPRENTICE TRAINING RESULTS SECURED BY A LECTURE COURSE AND SUPERVISION

By P. R. RAMP

The author discusses apprentice results secured in a large work jobbing foundry and pattern shop. The apprentices are given weekly lectures on important points of the work and are taught the why of everything they do. The good results secured are stated to be due to attitude of the foreman, the designing of the equipment for the best way of production and close supervision of the work of the apprentices.

Bronze-Welding Copper

This Operation Usually Gives Ample Strength and Tightness for Ordinary Commercial Work*

Much has been written about the welding of commercial copper in its various forms. Lately this problem has been investigated from a relatively new angle and with success. Previous to this work, much had been done in France; consequently a large proportion of the literature heretofore existing on the subject has been by French writers. The results the Europeans have obtained up to this time with copper, while good to a degree, have not been entirely satisfactory to American engineers.

Stated briefly, latest American practice recommends that copper work requiring high strength, unity of composition and high ductility, be done only on especially deoxidized copper for base metal. It is now possible to purchase such copper, deoxidized with silicon, manufactured with the view of giving it the best welding qualities.

Starting with this base metal, the welding is done with a special copper rod containing silicon, using a neutral flame,

The work is carried on quickly at the lowest possible temperature for satisfactory fusion. Silicon in the welding rod protects the base metal from undue oxidation. These practices carefully followed out, supplemented where possible by annealing or hammering, or both, give a weld that is perfectly satisfactory in all particulars.

For much copper work, such as repairs on existing equipment, or the use of stock sheets, metal deoxidized with silicon is not available. Many coppersmiths, maintenance men and steamfitters (especially the latter engaged in marine work) have found that a joint, tight and strong enough for most purposes, can be made in ordinary stock copper with bronze welding rod.

An eastern heating contractor has for some time been installing copper piping with such joints, testing them at city water pressure for strength and tightness. All of the work by this contractor has been good at the time of test; much of it has now been in use for several years with thoroughly satisfactory results, mainly in schools, court houses and other types of public buildings.

One of the questions often asked this man is whether or not he had even noticed any galvanic action between the bronze and the copper pipe, especially in pipe carrying water. His reply is that although he had expected such action and had looked for it, this difficulty has never been encountered in his experience.

The technique for bronze-welding copper pipe, copper castings, and copper sheet, is almost exactly the same as bronze-welding on steel or on cast iron. The parts to be joined are put into contact and must be heated to a temperature which will show red in the daylight, or just to the point where bronze will unite with the base metal, and a tinning layer of bronze is flowed on. Brazo flux is used freely in applying this first layer of bronze. After a surface has been tinned, bronze is built up on it to a proper thickness and width for the required joint. This work can progress along the seam in sections, tinning and building up 2-in. stretches one at a time.

On copper castings and material over $\frac{1}{8}$ -in. thick, it is best to bevel the edges. Welding is then done in the same way as described above. Considerable care must be used to see that the tinning coat is carefully and thoroughly applied to the bottom of the joint. Work should be completed as rapidly as possible, and with a minimum of heat. Be especially careful not to heat the copper any further back from the weld than necessary.

To provide for this last factor some oxwelders build up ridges of wet asbestos cement along the weld, far enough back so that these will not interfere with the work. If these tend to dry out they can be kept wet by adding water from time to time.

In summary: commercial copper, not especially deoxidized for welding, may be satisfactorily joined as follows:

Use a neutral flame, of minimum size.

Use first class bronze rod and Brazo flux.

Work at temperatures just above the melting point of the welding rod.

"Tin" two inches of the underlying metal.

Build up weld metal on this tinned surface.

Repeat the process until finished.

* From Oxy-Acetylene Tips.

Temperature Determination in the Metal Foundry

A Symposium Held at the Convention of the American Foundrymen's Association, Detroit, Mich., September 27-October 1, 1926

A Thermocouple for Ladle Temperatures of Brass

By A. A. GRUBB, L. H. MARSHALL and C. V. NASS

The advantages of temperature control in the foundry have received general recognition of late. It is no longer a question of the advisability of measuring the temperature of the molten metal, but the problem is rather to find a reliable method for use in the plant. The present paper concerns itself with a modified thermocouple that has been found to give satisfactory service with red brass. It is intended to confine the discussion to a description of the thermocouple and the service it has shown it will give.

In the manufacture of small brass castings there are at least two distinct points at which the temperature may be measured; first, in the melting furnace, second, in the pouring ladle. While furnace temperature is important, tests and experience have indicated that the temperature of the metal entering the mold is even more vital. The work described in this paper was directed toward securing some means of measuring the ladle temperature quickly and accurately.

OPEN END THERMOCOUPLE HAS DEFECTS

The open end thermocouple has been in use for some time for just that purpose, but all users and most pyrometer salesmen, even, will admit that such a couple is faulty. To be specific, it has three major defects. First, the slag on the metal coats the thermocouple wires and interferes with the temperature measurements sometimes completing the thermocouple circuit outside of the metal. Second, when using the open end couple the needle of the indicator generally fluctuates, making it difficult to determine the exact reading. Third, at its best the temperature measured is that of the surface of the metal which may differ appreciably from that of the interior of the ladle.

SPECIAL THERMOCOUPLE DEVELOPED

In the endeavor to develop a more satisfactory means for measuring the temperature many different instruments and thermocouples were investigated. The thermoelectric pyrometer system with a millivoltmeter indicator was adhered to in general, however, as being the most practical apparatus for use in the hands of unskilled labor under foundry conditions. Open end couples with various refractory coatings, a number of different kinds of protecting tubes, and other means suggested by pyrometer manufacturers were tried out in seeking a more reliable method for temperature measurement, all without success. It became evident, therefore, that the improvement sought could only be secured by special development work.

A protection tube that would not introduce too great a lag in the temperature readings and still have a reasonable life in service seemed an obvious way out of the difficulty. Work was accordingly inaugurated with that in mind. It was found that ferro-alloys of high chromium content offered quite remarkable resistance to the attack of molten brass. Consequently such alloys were used for the thermocouple tips described here.

There were two qualifications that had to be met in order to secure a quick reading couple. First, the mass of the protection tube must be as small as possible. Second, there should be the very minimum of thermal insulation between the hot-junction of the thermocouple and the molten metal. The use of a thin protection tube, which would form one element of the thermocouple, sug-

gested itself as a means of meeting these requirements. An insulated wire leading through the center of the tube and welded to its closed end would serve as the other element of the thermocouple. This equipment was made and found to work. It was discovered, however, that small counter electromotive forces were developed, due probably to differences in temperature of the surface and interior of the molten metal, that made the temperature readings uncertain by 20 or 30 degrees Fahr.

To overcome this difficulty it was necessary to use the two-wire couple and have the outer tube serve as a protection means only. The single wire trial had shown, however, that quick readings could be secured in that way; probably because the hot-junction was right in contact with the molten metal. It was decided, therefore, to keep this feature in the two-wire modification. Such a couple has worked satisfactorily from the start and with minor improvements is the type now in use.¹

DESCRIPTION OF SPECIAL COUPLE

Fig. 1 shows a longitudinal section of the thermocouple tip now in use. It will be seen that the piece con-

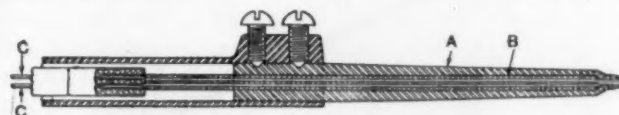


FIG. 1—THERMOCOUPLE TIP. A, ALLOY PROTECTION TIP; B, REFRACTORY INSULATOR; C, THERMOCOUPLE WIRES

sists essentially of the chromium alloy protecting tube (A, in which is inserted the two-hole refractory insulator (B). The 16 gage chromel-alumel thermocouple wires (C) pass through this insulator to the small end of the protection tube, where they enter a smaller hole in the end of the tip. These thermocouple wires, at the tip, have been flattened out with a die so that each forms a half circle and together they just fit the hole in the tip of the protection tube. This tip is then swaged down against the wires, preferably by means of a die, thus clamping the wires together and closing any opening through which the molten metal might enter. Better results have been obtained with such a junction than were secured either by twisting the wires or welding them at the tip.

The thermocouple is then mounted in a handle which consists of about two feet of twenty-two gage, five-eighths inch diameter, seamless steel tubing with a wooden hand grip. The protection tip is fastened into one end of the seamless tube by means of the two screws shown in Fig. 1. The thermocouple wires, previously strung with refractory insulators, lead through the tube to the wooden hand grip shown in Fig. 2. The cap has been removed from this piece to show the method of connecting the wires. The thermocouple wires (C) are fastened to the brass strips (D) by means of screws. These brass connectors are permanently attached to the wooden handle and have the chromel-alumel lead wires (E) soldered to them. The lead wires (E) go either to the indicator or to the cold junction box. The spring coil on the end of the handle serves to protect these lead wires from severe bending at that point.

¹ Patents have been applied for on this thermocouple.

As has been stated, the thermocouple is in direct contact with the protection tip. This contact cuts the time required to reach temperature and does not interfere with the accuracy of the reading, since the thermocouple is otherwise completely insulated from the protection tube and the circuit is consequently not completed. In prac-

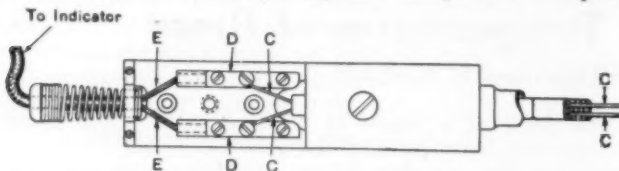


FIG. 2—THERMOCOUPLE HANDLE. C, THERMOCOUPLE WIRES; D, BRASS CONNECTORS; E, THERMOCOUPLE LEAD WIRES

tice a protection tip and thermocouple are assembled and kept in reserve. When the tip in use burns through, it is readily replaced by the spare part. This is accomplished by merely loosening the two screws that hold the protection tip in the end of the steel tube and unfastening the thermocouple wires from the brass connecting strips in the handle. The worn out tip and couple are then taken out and the new unit slipped in and fastened.

METHOD OF USING COUPLE

Having described the construction of the thermocouple, a few notes on its use will be included. It may be connected to either a portable or a stationary indicator, but the latter is more accurate and gives less grief in

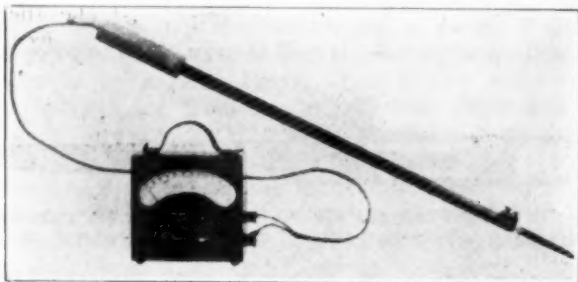


FIG. 3—THERMOCOUPLE ASSEMBLY WITH PORTABLE INDICATOR

service. A permanent installation of a high-resistance, millivoltmeter-type indicator, mounted on a rigid support, has proven very satisfactory. Such a set-up necessitates routing the ladles of metal to the pyrometer station, but that scheme has worked better than carrying the portable indicator to the pots. An added convenience can be secured with the high resistance indicator by having two thermocouples connected to the instrument through a double throw switch so that a spare couple is always at hand.

In practice the thermocouple is immersed in the molten metal for about three inches, stirring constantly with the tip. Moving it in this way cuts the time required to reach the metal temperature by about three seconds. The indicator pointer is watched and as soon as it comes to rest the reading is made. It requires around twenty seconds for the thermocouple to come to temperature from a cold start. This interval increases but slightly with use. After each immersion the hot tip is gently wiped on a wire brush to remove the adhering slag. Care must be exercised at this point not to break the tip, as



FIG. 4—MEASURING METAL TEMPERATURES IN THE FOUNDRY USING A STATIONARY INDICATOR

it is relatively fragile at the high temperatures. For the same reason, the thermocouple should be so supported when not in use that there will be no chance for its weight to rest on the tip.

Experience has demonstrated the serviceability of this thermocouple. Records of the tips used in the foundry show that with red brass, poured at 2000 to 2150 degrees Fahr., the average life of the tip is more than 800 immersions. When the pot temperature reaches 2300 degrees Fahr., however, the life of the tip is quite short; nor will it resist the action of phosphor bronze. On the other hand, trial runs in copper, yellow brass, and aluminum bronze have indicated the practicability of its use with these metals.

Pyrometer Control in a Brass Foundry

By ANDREW S. HALL

The success of pyrometer control in the brass foundry of a large electrical manufacturing company in the Philadelphia district is typical of what can be accomplished when intelligent supervision is applied. The recital of experiments and experiences at this particular foundry will do much to dispel the skepticism of some foundrymen who have condemned pyrometers in general because their own experiences in particular have been unsuccessful. Research on the part of the pyrometer manufacturer, together with the practical knowledge of the experienced foundrymen, is a combination that has overcome many of the foundrymen's difficulties.

EXPERIMENTS WITH VARIOUS TYPES OF PYROMETERS

What type of pyrometer to use was quite a serious matter to be decided and many experiments were made before a reliable, practical and successful pyrometer was secured.

The optical pyrometer was tried for a time, but with such poor success that it was finally discarded as being impractical for temperature readings of non-ferrous metals. Especially was this true on account of the time factor. In taking a temperature reading, an immersion tube was inserted into the metal and the optical pyrometer sighted at the inside of the immersed tube. As a

result of so much time being consumed until the immersion tube could assume the temperature of the metal and a reading taken, the metal cooled too much.

After experimenting with various makes of base metal pyrometers, a quick acting portable and extensible pyrometer was selected as being the most practical pyrometer for foundry use.

This pyrometer provides a reliable and inexpensive means for quickly taking temperature readings of brass, bronze and aluminum. A brief description of the pyrometer will serve to give prominence to the features which appeal to foundrymen.

DESCRIPTION OF PYROMETER

This pyrometer consists of a direct reading portable indicator and an extensible magazine thermocouple. The portable indicator is contained in an aluminum case and is provided with a handle so that it is very easily carried about the foundry. It is calibrated for a temperature scale range to 2400 degrees Fahr., the temperature graduations being in 20 degree divisions and easily readable to 10 degrees. The thermocouple consists of two steel tubes, each of which are insulated throughout their entire length with porcelain insulators. These two steel tubes are fastened into an aluminum head in which are mounted two spools of thermocouple element wires. In operation these wires are drawn down through the tubes and extended to a length of about 12 inches; the ends of the wire are then twisted tightly together to make the hot junction. No weld is necessary.

QUICK ACTING FEATURE

In order to take a temperature reading the twisted junction of the wires is immersed in the metal. The wires being small in diameter (approximately 1/16 of an inch) they immediately assume the temperature of the

stationary oil furnace and one pit type oil furnace. Temperature readings of the metal are taken while the metal is in the furnace and again when the pots are drawn from the furnace and the metal is ready to pour. The foundrymen do not resent this pyrometer because with the quick acting feature no loss of time is occasioned when taking temperature readings.

DEFINITE POURING TEMPERATURES

It is now the practice in this foundry to take temperature readings both while the metal is in the furnace and when it is on the floor ready to pour. For every mixture of metal definite pouring temperatures are specified. Table 1 gives some approximate pouring temperatures of various alloys which for general foundry work has been found very useful. Of course, practical experience and local conditions will decide when variations from these temperatures should be made.

THE PYROMETER AT WORK

The variety of the work in this foundry can readily be appreciated, castings range in size from 1/4 of a pound to 4,000 pounds. A considerable quantity of aluminum is cast in addition to brass and bronze.

One very interesting instance of exact temperature control is in the pouring of aluminum alloy manifolds for gasoline engines. The pouring of aluminum alloy should be done at the lowest possible temperature at which the metal will run and completely fill the mold. A temperature of 1,250 degrees Fahr. is generally satisfactory. A low pouring temperature is particularly important for aluminum alloy castings because of the high-specific heat of the metal: If poured at a high temperature, the metal in cooling heats the mold so hot that the rate of cooling is very slow, which results in a coarse

TABLE 1—APPROXIMATE POURING TEMPERATURES
All Temperatures are in Fahrenheit Scale.

Metal	Mixture	Degrees Fahr.		
		General Work	Light Castings	Heavy Castings
Aluminum	Pure	1,400		
Aluminum	Alloy	1,300	1,300	1,250
Red Brass	85—5—S	2,000	2,150	2,000
Red Brass	82—4—6—8	2,000	2,100	1,950
Yellow Brass	15 to 20 per cent Zn.	2,000	2,100	1,950
Phosphor-Bronze	80—10—10	1,950	2,000	1,900
Manganese-Bronze	87 Cu.—7 Sn.—6 Zn.	1,800	1,950	1,780
Acid Resisting Bronze	88 Cu.—6 Sn.—4 Pb.—2 Zn.	2,150	2,100	2,000
Bronze	{70 Cu.—20 Pb.—6 Sn.}	2,000	2,100	2,000
Bronze	{other metals 4 per cent}	2,150		
Bronze	87 Cu.—8 Sn.—5 Zn.	....	2,050-2,100	1,900-1,950
Nickel-Bronze	84 Cu.—10 Sn.—2 Zn.—4 Ni.	2,100	2,150	2,100
Gun Metal	88—10—2	2,050	2,100	2,000

metal and a temperature reading of the indicator is quickly secured in 10 seconds. A number of readings can be taken with the same junction, depending upon the alloy. After several temperature readings, the junction may be destroyed and all that is necessary is to retwist the wires, which can be done in about one minute. The junction can be renewed several times before another supply of wire need be drawn out from the tubes. The thermocouple is furnished with a supply of element wire, consisting of 50 feet of positive and 50 feet of negative wire. With this extensible feature, there is really a thermocouple 50 feet long with the advantage of being able to renew the thermocouple by making the hot junctions whenever necessary; this is done quickly because no weld is required. The supply of wire can be renewed whenever necessary at a very nominal cost.

FREQUENT TEMPERATURE READINGS

The furnace equipment at this foundry consists of seven natural draft pit furnaces, one electric furnace, one

grain and weak metal. Aluminum alloy castings are always stripped as soon as they are set, to prevent cracking. A number of tests were made in casting these manifolds with the following results: at 1260 degrees Fahr., the castings cracked; at 1220 degrees Fahr., the metal would not run sufficiently to fill the mold. At exactly 1240 degrees Fahr., the metal was fluid and exceptionally good castings are made. The effect of high pouring temperatures on the strength of aluminum cast-

TABLE 2—SHOWING HOW HIGH POURING TEMPERATURES AFFECT THE STRENGTH OF ALUMINUM CASTINGS.

Temperature Degrees Fahr.	Tensile Strength Pounds per Sq. In.
1,200	20,000
1,250	19,500
1,300	19,200
1,350	18,500
1,400	18,000
1,500	17,500
1,600	16,000

ings, is clearly shown by Table 2. These data were compiled by Dr. Paul D. Merica, of the International Nickel Company, and tests have proven it very valuable. When working to very close temperature limits as just described, it is advantageous to use a table or solid foundation of some sort on which to rest the pyrometer.

Another instance where the pyrometer proves especially valuable is in the casting of large air pump runners for turbine condensers weighing 3,000 pounds made of an 88 copper-12 tin mixture. To make these castings, it is necessary to draw the pots and pour the metal into a large pouring ladle, then pour the metal into the molds. The best pouring temperature for these runners was determined at 1900 degrees Fahr. Of course, the metal was brought to a higher temperature in the furnace and when sufficient metal was in the large pouring ladle, the metal was allowed to cool. Several temperature readings are taken in quick succession, but this is very easily done because only 10 seconds is required to secure each read-

ing. When the pyrometer indicates 1900 degrees Fahr., the mold is poured and very good castings have always been secured.

The casting of bronze water pump runners for turbines of the same composition also presented some difficult complications. These water pump runners weigh approximately 1800 pounds and to lose one of these castings means a loss of considerable money. Making the molds alone is an expensive item and if the casting should prove a failure the loss in remolding and remelting is large. Previous to using this pyrometer the casting of these water pump runners was a problem that caused a great deal of worry. Now with the quick reading pyrometer, the loss of a water pump runner casting is unthinkable. The savings resulting from the use of this pyrometer in the casting of these water pump runners alone have been sufficient to pay many times over for the two pyrometers which are used regularly in this foundry.

The Use of Pyrometers in the Casting of Non-Ferrous Metals

By R. D. BEAN

The progressive foundryman has eliminated guesswork and has substituted in its place the accurate measurement of melting and pouring temperatures. This does not imply that good castings cannot be made without the aid of a pyrometer, but miss-runs are not a necessary evil, and there is always room for improvement in the size of the scrap pile. Under certain operating conditions a pyrometer equipment will pay big dividends, and this has been demonstrated so often, even in the small foundry, that this statement requires no further discussion to substantiate it. This is particularly true in a foundry making a variety of castings where different metals are poured every few days. Errors in estimating temperatures are bound to occur with resultant loss in production from defective castings, and experience will gradually convince the foreman that a pyrometer is more accurate and dependable than the eye.

SELECTING THE PROPER EQUIPMENT

The simplest type of pyrometer equipment for measuring molten metal temperatures consists of a portable bare wire thermocouple, with suitable handle, connected to a small portable indicating instrument with about 3 feet of flexible lead wires. A combination frequently used consists of a chromel-alumel thermocouple and an indicating instrument with a range of 0 to 2600 degrees Fahr.

The instrument should preferably be a high resistance type, so that changes in the length of the couple, or in its cross section, will have a negligible effect on the accuracy of the readings. This type of instrument was almost unknown a few years ago, but the instrument designer of today can produce a portable indicator of the above range, having a total resistance of about 600 ohms, which will stand up surprisingly well and maintain its accuracy if a reasonable amount of care is used in handling it. The current required to deflect the pointer to full scale value is only .00008 amperes and the pointer will follow the changes in the couple temperature as fast as the changes occur. The weight of the movable coil is so small that there is practically no swinging of the pointer before coming to rest, and a reasonable amount of jarring will have no effect on the pivots and jeweled bearings.

The wires connecting the instrument to the thermocouple should be of suitable material to extend the cold junction of the thermocouple to the instrument binding posts. This will eliminate errors due to changes in temperature at the cold end of the couple which is frequently exposed to the radiant heat from the metal, particularly

when readings are taken with the couple extending vertically downward into a ground level furnace. Portable instruments are available with automatic means for compensating for changes in the cold junction temperature when the cold junction is extended to the binding posts of the instrument. If the instrument is not automatically compensated, corrections must be made in the reading whenever the temperature at the cold junction is different from the temperature at which the instrument was calibrated. This temperature is usually indicated on the scale of the instrument by a suitable mark. On instruments having evenly graduated scales, without automatic compensation, the pointer should be set to a point on the scale corresponding to the temperature of the room. This adjustment is made by means of a zero adjuster screw and must be made when the thermocouple is disconnected from the instrument.

The thermocouple is usually constructed in such a way that the tip is easily replaceable. The welded hot junction will last for a long period of time in metals like pure aluminum or copper, but will dissolve rapidly in certain alloys containing zinc. The couple will continue to give accurate readings, even after the welded junction has dissolved, leaving the two wires separated, providing they are close together and there is no accumulation of metal or slag on the wires. In another construction for molten metal measurements, the couple wires are wound on reels in a magazine, and the hot junction is renewed by drawing out a few inches of the wire and twisting the two ends together. A portable equipment with bare thermocouple makes a handy type for taking quick readings from a crucible just before pouring. From seven to ten seconds are required for each reading. This same type of equipment is also suitable for taking readings of the melting temperature of aluminum in a tilting crucible furnace.

On some applications it is convenient to use a wall type of instrument which may be either indicating or recording. The scale of the instrument is drawn with large figures easily read at a distance of several feet. The instrument is located near the melting furnaces or at some convenient location where several crucibles can be reached within a radius of fifteen or twenty feet. A recording instrument makes a permanent record of the temperature of each pouring as well as the number of pourings.

SOME TYPICAL APPLICATIONS

The value of a simple type of portable indicating equipment is illustrated in the case of a concern manu-

facturing aluminum pressure cookers. The miss-runs were averaging around 15 per cent and considerable difficulty was experienced with leaky castings. The large thin-walled molds presented a difficult problem and several sizes were being made. The aluminum had to be hot enough to fill the molds, and yet give smooth castings that would hold pressure. After using a portable pyrometer equipment, the man worked out the proper temperatures for each different casting according to the size and thickness of the walls. For several years since, the miss-run losses have been less than 1 per cent and the number of leaky castings due to excessive shrinkage is negligible.

A foundry pouring bearing metal worked out a novel arrangement with a recording pyrometer. The instrument was mounted on the wall and a thermocouple was suspended from an overhead beam; the cable running over a pulley and having a counterweight slightly heavier than the couple. As each crucible was pulled, the thermocouple was lowered and a reading taken. The thermocouple then was released and swung up out of the way until the next crucible was ready. By examining the chart record made by the recorder, the foreman knows the temperature of each pouring and the number of pourings made each day, also the time at which each pouring was made. The bronze alloy used in this foundry was run at about 2100 degrees Fahr., and the replaceable tips dissolved quite rapidly. It was necessary to use from two to three replaceable tips per day. Experiments were made using a metal protecting tube sold under a trade name, and this material lasted for two hundred or more immersions. The metal protecting tube should have as thin a wall as practicable so as not to increase the time lag appreciably. This particular protecting tube is drilled from solid rod and the wall thickness for a tube 10 inches long is preferably from 1/16 of an inch to 3/32 of an inch thick. In order to maintain a uniform wall thickness these tubes are drilled on a rifle-drilling ma-

chine. The lag with a protecting tube of this type varies from 45 seconds to 2 minutes, depending upon the diameter of the tube and the wall thickness. A one minute lag with a large crucible or tilting furnace is not objectionable to the men, and a thin-walled tube is likely to have as long a life as a thick-walled tube owing to the shorter period of immersion to obtain a reading.

Recording pyrometers have also been applied quite successfully to tilting ladles for molten copper, to record the temperature of the copper as it goes into the ladle for transfer to the molds. For this application a platinum thermocouple is used, having a primary protecting tube of porcelain and a secondary tube of chromium iron alloy. A thermocouple of this construction has an appreciable lag, but owing to the size of the ladle and the time taken to fill it, the lag does not slow up the process. The couple is installed horizontally through the side of the ladle, partly imbedded in the cement lining at the bottom, so that the top surface of the protecting tube is exposed to the molten copper.

AUTOMATIC CONTROL

Automatic temperature control has been applied to oil-fired stereotype pots with marked success and considerable saving of time. The thermocouple is permanently installed in the pot and the pyrometer is equipped with electrical contact tables which can be set at the desired operating point by means of an external adjusting screw. The contact tables close the circuit to relays which in turn operate a small electric motor geared to a valve which controls the amount of oil or gas fuel. Only one skimming of the metal is necessary and the temperature can be held consistently at 600 degrees, finishing the run with a pot full of metal at the right temperature. When the pot is not in use, the index on the control pyrometer is lowered to hold the pot at a lower temperature until ready for the next run. In newspaper work where time is a vital factor, this equipment has been a real asset.

Temperature Control in the Brass Foundry

By H. M. ST. JOHN

In the foundry itself there has always been a certain prejudice against pyrometric control of metal temperatures. Until rather recently there have been good reasons for this prejudice. The best available equipment was delicate and not altogether reliable. It could not be put into the hands of a foundry worker with satisfactory results. From the foundry superintendent's point of view pyrometers were not practical. This condition has changed. In the present state of the art, foundry pyrometers, while far from perfect, are practical. The foundry superintendent, once he has become familiar with the use of pyrometers, favors them because they relieve him from much tiresome detail and reduce his scrap.

Whatever opinion one may hold regarding the accuracy of the human eye in judging metal temperatures, it must at least be admitted that the expert eye is the result of long experience and constant practice. No foundry has more than one or two experts whose judgment of temperature is really good and if, for any reason, these men are absent or off color, the castings suffer.

Pyrometers are now available which, in the hands of a reasonably bright boy who has been trained for a week or two, will give more consistently reliable results than the most skilled and experienced eye. Once convinced of this, the expert foundryman breathes a sigh of relief and turns his attention to other things.

PRODUCTION FOUNDRY OFFERS GREATEST FIELD FOR
PYROMETER USE

It is probably true that the pyrometer finds its sphere

of greatest usefulness in the production foundry, where much the same castings are made day after day.

The problem is to so gage the temperature of the metal that the largest possible number of molds can be poured from a pot of metal without making scrap by pouring the first molds too hot or the last ones too cold. The number of molds which can be poured successfully depends upon the pouring range of the casting and the exactness with which the molten metal temperature is known.

By pouring range is meant the limiting temperatures between which the metal can be poured into sound castings which will have the desired properties. This range may be as much as 100 degrees Fahr. or more, or it may be as little as 40 degrees Fahr., depending upon the design of the casting and the properties required of it. Any casting which must be poured at an exact temperature within limits of less than plus or minus 20 degrees Fahr. is not designed for economical handling in the foundry. If such a casting must be made a liberal scrap allowance is necessary.

As an illustration, consider the case of a casting which can successfully be poured at any temperature between 2050 degrees and 2150 degrees Fahr. If only one mold were to be poured it is obvious that almost anyone, given a little experience, could gage the metal closely enough with the eye to pour sound castings. No great accuracy is required if one has a margin of plus or minus 50 degrees Fahr. But, for the sake of economy in handling the metal, a number of molds must be poured from the

same pot; the greater the number the greater the economy. Assume that the metal in the pot cools at the rate of 20 degrees Fahr. per minute and that three molds can be poured per minute. Then, if pouring is started at exactly 2150 degrees Fahr., fifteen molds can be poured before the falling temperature reaches 2050 degrees Fahr. and the castings will all be good, so far as temperature is concerned. If, through inaccurate determination of the temperature, pouring is started at 2110 degrees Fahr. instead of 2150 degrees Fahr., and fifteen molds are poured, the last six molds poured will produce bad castings. Similarly, if pouring is started at 2190 degrees Fahr. the first six molds poured will be bad. If, in order to play safe, only nine molds are poured instead of fifteen there is a considerable sacrifice of economy. Evidently it is highly desirable to begin pouring precisely at 2150 degrees Fahr., or as closely so as may be practicable. With a properly calibrated pyrometer in capable hands it is possible to do this within plus or minus 10 degrees Fahr. Nothing like such accuracy is attainable in any other way.

In the case of castings which have a pouring range of 40 or 50 degrees Fahr., and there are always some of these in almost every foundry, the pyrometer is even more valuable and necessary. The foundry superintendent, who formerly found it essential to give personal supervision to the pouring of such castings, is now relieved from an exacting and troublesome responsibility.

EXTENT OF USE IN FOUNDRY

In our plant approximately 400 temperature readings per day are taken when the foundry is busy. The procedure is as follows: The metal is always taken from the furnaces at a temperature higher than is required for the work, in order that it may be cooled to exactly the desired temperature. In the case of the electric furnaces the margin of excess superheat is very slight since the temperature of the metal leaving the furnace can be closely predetermined; in the coke fires no such accuracy of control is possible and the superheat is commonly 100 degrees Fahr. or even more. The metal is taken to a skimming station, stirred and skimmed. It is then cooled, under the direction of the pyrometer operator, by stirring in gates or pigs until the temperature is supposed to be about 50 degrees Fahr. above the desired point. A reading is then taken and, based on this reading, the metal is cooled to the desired temperature, which is checked by a final pyrometer reading. Each pyrometer reading takes six seconds; the entire procedure, including stirring and skimming, is carried through in approximately one minute.

READINGS TAKEN AT SKIMMING STATION

It will be noted that all temperatures are taken at the skimming station, rather than at the mold. The pyrometer man, who is a foundry employee, receives his instructions from the foundry superintendent as to the work on the floor and the metal temperature required for each class of work. In giving these instructions the superintendent makes due allowance for the loss of heat during transportation of the metal to the molds. This allowance is the result of both experience and test and can be made quite accurately.

As the metal leaves the skimming station, the pyrometer man hangs a tag on the ladle trolley, showing in large figures the result of his final reading. The pouring boss, in deciding how many molds can safely be poured in any class of work, is governed entirely by the temperature report shown on the tag.

ALLOYS VARY IN FLUIDITY

All of our alloys are held very closely to analysis. Composition ingot and other metals are purchased on

rigid specifications and carefully checked to these specifications before being used. In spite of these precautions, we find that the pouring quality of the metal is not a constant factor.

The best pouring temperature for any given casting varies from time to time according to the quality of the metal which is being used, in spite of the fact that there has been no change in the analysis. For example, in starting a new lot of ingot we discover that the metal is more fluid than before and that it is necessary to reduce all pouring temperatures in order to avoid "burn in" and spongy castings. This variable is regulated by taking as a standard a casting which is in constant production throughout the year.

Suppose that the foundry has been pouring this casting at 2200 degrees Fahr. When a change is made from one lot of ingot to another, the first molds of this casting poured from the new mix are blown out and examined by the foundry superintendent or pouring foreman, who then decides whether a pouring temperature of 2200 degrees Fahr. is still suitable or whether a change of 20 or 30 degrees Fahr., up or down, should be made.

If a change is made with respect to this casting, a similar change is made throughout the foundry wherever this particular metal mix is being used. This works very satisfactory on the general run of our work, where the pouring range is 100 degrees Fahr. or more. In cases where the pouring range is only 40 degrees Fahr., or thereabouts, it is essential that the metal used be very uniform, day in and day out. This uniformity can, of course, be accomplished whenever the results to be obtained justify the expense of doing so.

Lack of uniformity in the fluidity of composition ingot, scrap copper and the like is probably due to a variation in dissolved oxides and the presence of other impurities in various physical states, the nature of which cannot always be determined by chemical analysis.

TYPE OF PYROMETERS USED

The pyrometers used are of the exposed-couple, base-metal type, with low-resistance, portable meters. The tips are 19½ inches long and average better than 125 readings per pair. All pyrometers are checked twice a day in the foundry against a standard instrument. At the slightest evidence of inaccuracy the meter under suspicion is withdrawn from service and rechecked in the laboratory. Usually repairs and adjustments are made in our own laboratory but occasionally—about once in six months—the meters are returned to the makers for a thorough overhauling.

PRECAUTIONS TO BE OBSERVED

In reading molten metal temperatures with an exposed couple a number of precautions must be carefully observed. A certain aptitude on the part of the operator is also required. Nine men out of ten can acquire the necessary skill without difficulty. An occasional man who may be selected as apparently qualified for the job will prove to be hopelessly unable to master the required technique. Two qualified operators should always be able to check each other within plus or minus 10 degrees Fahr., each using his own pyrometer at the same time in the same pot of metal.

Before taking a reading the metal should be skimmed clean. The tips are then immersed at the center of the exposed metal surface to a depth of not less than three inches. The couple is held in this position until the meter needle comes approximately to rest, taking care to hold the tips as nearly motionless as possible and, above all, not touching the edge of the pot. The position of the needle at this point represents the temperature of the metal surface but the reading is not a reliable one since

it cannot be checked within 30 or 40 degrees Fahr. The couple is then raised quickly until the ends of the tips are barely immersed. The tip ends, because of their deeper immersion, are at a temperature higher than that of the metal surface, and bringing them to the surface causes the meter needle to rise anywhere from 20 to 100 degrees Fahr. The type of meter used is practically "dead beat" and the highest point reached by the needle, before it starts to settle back, is taken as the metal temperature. This reading can be checked time after time and, according to our experience, consistent readings can be obtained in no other way.

Before taking another reading a coarse file must be run over the surface of the couple to remove oxide and congealed brass. The couple need not be perfectly clean but should present a fairly large surface of bright metal. The tips must be of equal length and if one has melted

away more than the other the end of the longer tip should be cut off.

BRASS FOUNDRY PYROMETER CAN BE IMPROVED

Brass foundry pyrometry, in the present state of the art, is by no means so perfect as it should be. The use of an exposed couple has the advantage of giving a consistent reading in six to eight seconds, but the method is not so foolproof as might be desired. The use of a protected couple reduces variations due to the human element but, in our opinion, it takes far too long to get a reading. The constant checking of meters and couples is rather a nuisance; it is to be hoped that pyrometer manufacturers will soon be able to improve this condition. In spite of these drawbacks it can be confidently said that the use of pyrometers in the brass foundry is now not only practical but also highly profitable, and probably capable of nearly universal application.

Visual Judgment of Non-Ferrous Metal Temperatures

By R. R. CLARKE

In judging any temperature to suit any need, two things must be known and understood: first, the proper temperature itself and, second, the manifestations of the metal at that temperature. The first is purely a matter of judgment derived from the size, the bulk, the section, etc., of the casting to be poured. The second calls into play both the senses and the judgment and involves their concerted activity.

Most metal temperatures are judged by sight from the standpoint of either the color or the viscosity of the metal, or both.

JUDGING BY COLOR

Different metals and alloys vary sharply in color manifestations and no well defined or uniform standard of comparison can be taken by which to judge them. That all metals and alloys whiten toward sunlight with advancing temperature is about the nearest to a general rule that can be stated. Some metals proceed from red to white, some from yellow to white, some from red to yellow to white. It is, therefore, clear that in judging by color each metal and alloy is a law unto itself and must be known in its details of peculiarity in order to exercise intelligent judgment on it. As a matter of illustration, a few common metals and alloys will be discussed, as follows:

Copper: Copper appears dull red at low liquid temperature and proceeds to a bluish white with temperature. Free of oxides at high temperature it is beautifully clear and limpid.

Aluminum: Aluminum in shadow appears white at low temperature, advances to red at higher temperature and assumes a pale orange white at extreme temperature.

Copper 85-Tin 5-Lead 5-Zinc 5: This metal proceeds with increasing temperature from a reddish yellow to a yellowish white, interspersed with a bluish tint. This bluish tint shows at temperatures where the zinc volatilizes, giving the zinc-volatilizing color.

Copper 88-Tin 10-Zinc 2: This mixture is reddish yellow at low temperatures, yellowish white at high, "waved" with brilliant tints of blue and purple and gold. These tints derive from the tin content, which exhibits these distinctions at high temperatures.

Copper 80-Tin 10-Lead 10-Phosphorus traces: This alloy is blood red at low temperature, advancing to white with rising temperature.

Copper 70-Zinc 30: This metal is dull yellow at low temperature, yellowish white at high temperature, flaring with brilliant bluish yellowish tints that are caused by the volatilizing zinc.

Regarding these different manifestations as stated, it might be noted that they represent those appearing in reflected sunlight, or in ordinary daylight shade. When the shade becomes abnormal, as on a dark day, the color varies perceptibly toward a lighter effect. Thus, different alloys appearing red on a bright, clear day will appear white at the same temperature on a dark, cloudy day. Another distinction to be observed is metal in daylight and metal at night in artificial light. The difference in appearance often leads to bad errors of judgment if not known and observed. In total darkness all metals and alloys of high fusing temperature take on a greater whiteness and brilliancy.

FLUIDITY FACTOR

Fluidity in its varying degrees is a consequence of temperature and, to a well developed and finely discriminating sense constitutes a safe and stable indication of temperature; viscosity of metal is therefore the real and decisive test, the most nearly scientific test to which judgment can address its determining powers. It is freely used by some molders and as freely neglected by others, the difference representing largely natural aptitude along with prevalent practice at the time of learning the trade.

Viscosity can be determined both by sight and by feeling and the two taken together afford a check against each other by which the condition of the metal can be quite accurately judged. The hotter the metal, the more fluid; the colder, the more viscous, makes up the fundamental principle of the system. Fluid metal as against viscous metal exhibits many distinctions plainly marked. It looks thinner, its surface lies flatter, it hugs the walls of the crucible closer, it displaces more easily, its dross and impurities ride higher and easier; a solid immersed in it meets much less resistance, it flows faster, easier, cleaner. It adheres to congealing walls less tenaciously, etc. These and various other exhibitions can be discerned either by sight or feeling or both and the relative temperatures they indicate may be judged by them. The end of a skimmer bar pushed over a metal surface will indicate the viscosity of the metal by the resistance it meets, as will the behavior of the liquid metal coming to rest following the disturbance.

Of course, close study and experience, along with an appreciation of different specific gravities of different metals and alloys, are essential to enlightened application of the viscosity test and are ever to be reckoned with in connection with it. One of the first tests on the alloy copper 80-tin 10-lead 10-phosphorus trace, the author learned, was to immerse a skimmer bar in the metal bath,

hold it there a second and withdraw it. When the metal dripped off the drawn skimmer like buttermilk, it was ready to pour that particular casting.

As a general rule, cold metal by its very viscous appearance to sight shows its coldness. To first glance it appears numb, lifeless, and molders often remark, "It has a dead look." When a metal, an alloy, or some ingredient of the alloy, has reached its boiling point, an iron skimmer bar immersed in the bath will record the agitation of boiling to the sense of feeling in the nature of a clicking or crackling sensation. This phenomenon is quite in evidence in the high zinc-copper alloys and is frequently used as a basis of judgment in high temperatures of those alloys.

If a bar of solid metal free from protective coating be immersed in a bath of kindred metal at high temperature, the solid metal will melt and disappear rapidly. If the metal bath be lower in temperature the bar will melt and disappear proportionately more slowly. This furnishes the basis for another observation test on metal temperature.

ACTION OF METAL IN SPRUES

When hot metal comes to rest in a sprue head, the time consumed by the metal in this head to completely solidify is quite extended. If coming to rest at a lower temperature, the solidifying period is perceptibly shortened. From this it is possible to derive a good check on temperature by observing the sprue head of a mold poured first among a number of molds to be poured from the same pot of metal.

The static pressure of liquid metal in a filled sprue advances with the fluidity of the metal. If a sprue be filled with hot metal, the metal after filling the sprue will sink down in the sprue much farther than will colder metal. This may often indicate a severe swelling or sand-burning of the casting from too hot metal.

In his molding days, the author always prepared his first two molds for pouring especially for hot metal. He would then bring his metal on the warm side to these molds, pour them and note the time it took the sprue head to solidify as well as the depth of descent of the metal in the sprue. This furnished a basis for one of the safest and best tests and corrections on metal temperature to which, in all his experience, he ever resorted.

PHOSPHORUS INFLUENCE

Regarding metal viscosity it might be noted in passing that alloys without phosphorus usually present a rather viscous and misleading surface appearance, due to the oxide film occasioned by the atmosphere on that surface. The metal therefore appears colder than it really is. If a little phosphorus be added, as is often done, the metal at once looks relatively hotter than it really is, in that the elimination of the oxide film reveals the metal in its actual under-mass state. This thinner appearance of a metal surface when phosphorus is added is sometimes erroneously assumed to indicate that the phosphorus raised the temperature of the metal. The most the phosphorus does is to clarify the surface by reducing the oxide scum, giving the surface metal a thinner, clearer appearance. The same appearance will exhibit under a layer of charcoal over the surface metal. Under extreme temperature, many metals and alloys become so oxidized as to appear "lumpy," "granular," "thickened," "viscous," etc. In this state of oxidation they are "lumpy," "granular," etc., just as they appear to be, but the condition is due to excess of temperature rather than lack of it.

When a filled sprue in solidifying swells up instead of shrinks down, the indication is that the metal is suffering from included gases and oxides and suggests either bad furnace practice or too high temperature in pouring the metal.

Type Metal Mixtures

Q.—We are opening a new department in our machine shop and may need to make use of electro-plating devices for tin plating, cold rolled shafting on which a good type metal alloy of about 1/2-in. thickness is to be placed. We may desire the type metal made up both in the ordinary grade, which is a rather soft metal and also a harder grade by adding antimony or any other metal which causes the alloy to be harder and tougher than the ordinary type metal.

It would also be of interest to know the composition of alloys used in die casting.

It is the understanding of the writer that steel shaft should be electro-plated before type metal is poured around it so that a good adherence of the type metal is assured. However, I may not be properly informed on this.

A.—The compositions of these alloys vary considerably. The following formula are used:

No.	Lead Per Cent	Tin Per Cent	Antimony Per Cent
1	68	14	18
2	35	60	5
3	82	6	12
4	82	3.2	14.8
5	70	13	17

The standard linotype metal consists of:

Lead	83
Tin	5
Antimony	12

In reference to the composition of alloys used in die casting, we would refer you to the issue of THE METAL INDUSTRY of September 1920, page 410. This article gives a full description of the composition used in die casting by a very reliable authority.

It is said that when steel is electro-plated, type metal will adhere to it much better and make the job more satisfactory.—W. J. REARDON.

Brass Cutting Compound

Q.—In threading high brass tubing we have been using oil as a cutting compound. This is very hard to take off before plating and buffing and we believe there are other compounds which would do the work as well and be easier cleaned. If you can give us any information on this we shall appreciate it very much.

A.—For thread cutting on brass tubing a suitable threading compound can be used with machines running at high speed. Satisfactory results can be obtained by using an emulsifying or soluble cutting oil which can be procured from several companies. They are mixed in the proportions of about one part of compound to forty parts of water, and have a milky appearance when mixed.

In threading brass tubing see the chasers have a slight hook ground on them as tubing is softer than cast brass and you will get better results.—P. W. BLAIR.

The Fundamentals of Brass Foundry Practice

A Description of the Basic Laws Which Control the Melting and Casting of Metals and Their Application to Practical Foundry Operations*—Part 4

Written for The Metal Industry by R. R. CLARKE, Foundry Superintendent

From the button gate on through the runner gates the principle holds, and practice to be safe must meet the exactions. To be correct and safe, sand around runner gates should be in very best condition and the gate surfaces softened and slightly roughened. Hard and "slicked" or glazed gate surfaces may look artistic enough, but they invite disaster. In plated and gated-up work as well as in the use of set gates, the situation reverts to the ramming of the sand. Where the gates are cut by hand, as in loose work, the hand finishing of the cut gate becomes the factor of control. Wherever a gate sets or is to be cut, sand should be of best quality and condition and consistently soft of surface. Between a molder who merely cuts a gate in a hard sand surface and the one who fingers the cut gate to consistent softness and roughness of surface lies the vast difference of guideless effort and stabilizing principle. Under identical conditions of sand and metal, the former gate will often cut and scab when the latter gate will flow placidly and be entirely free from these troubles.

In the pattern impression itself, action and reaction take their final fling at the casting. If the mold is properly conditioned, the metal fills in and comes to rest placidly, so remaining throughout solidification. If improperly conditioned the metal finds no rest. Even though the mold surfaces hold intact against this disturbance and the disturbance cease by the time the mold is filled, the metal by this disturbance works into and out of its body mass, metal dross that localizes in some particular spot or section and bids fair to disqualify the casting. Moreover, the last smash of reaction is metal-ward from the reacting surface and if delayed until a crust of metal forms at that surface the casting surface will invariably show it there.

As noted, reaction occurs most violently from hard and glazed surfaces and can occur in dry sand molds and cores. It can also occur in the face of all venting of molds and cores. Reaction's form of expression on liquid metal is usually a kick or rebound of the metal and differs from a mold or core "blow" in that the latter represents a constant gaseous pressure that more steadily displaces metal. Thus the common expression among molders is "The metal kicked off the core," in the one case, and on the other hand, "The core blew." From a hard or glazed core surface metal will, therefore, contend against a core by reaction, regardless of the composition, the venting or the dryness of the core. This condition of hardness and glaze sometimes shows up in cores made on the "sausage grinder" type of core machines, when the nozzles of the machine happen to be of excessive length. The hardening and glazing effect of too great nozzle surface is such as to render the core questionable. Shortening the nozzle readily adjusts the matter.

Other hardening and glazing factors of dry sand surfaces are: too wet when rammed; polished surfaces of patterns and core boxes; sand too close or of excessive natural bond; and a core or mold wash too strong in bond. Slicking the sand surface with a tool also hardens and

glazes it. Because of this, all excessively smooth or polished sand surfaces, are likely to give trouble. Whatever the cause, smoothness should be slightly roughened by hand-rubbing. This precaution has been found to avoid many cases of metal unrest.

The condition of the sand and its correct ramming constitute the main precautions against the concerted powers of reaction and mold gas pressures to disturb metal. The importance of each is sufficient to warrant brief remarks concerning them.

CONDITION OF SAND

Nothing is more important to good molding than the condition of the sand used. It should be neither too wet nor too dry, and should be uniformly tempered throughout. If too wet, the metal will not run quietly over it nor lie calmly on it, but instead will boil and bubble, causing cutting and scabbing of the mold, resulting in rough and dirty castings. If too dry, it not only gives trouble in making a neat, unbroken sand appearance around the pattern surfaces, but is much more likely to fall out of the cores in closing them over the drag, as well as to break down and give way in delicate parts of the mold. In heavy molds requiring a quantity of metal, dry sand will often crumble and wash away before the mold is filled and rough and dirty castings result. This condition is often in evidence in the gates and around those parts of the mold where the gate enters the casting. Another bad feature about too dry sand is that in rubbing or brushing a facing on it, such as talc or plumbago, we never get the good bond between the facing and the sand, or the neat job from it as would come from sand in better condition. Wet sand cuts and scabs, dry sand washes away. Both leave a rough spot or surface on the casting and both make for dirt in the casting. In looking at a dirty casting with rough surfaces, it is often hard to tell whether the sand washed away from being too dry or cut away from being too hard or wet. Usually a wash-away looks more like a scratch, or a scar; a cut-away more like a scab. Hence the term "scabbing of sand." Sometimes this cutting or scabbing or washing occurs in the gates, and the casting is dirty, but shows no signs of cutting, washing or scabbing of sand. Always examine the gate of a dirty casting; the trouble may have all occurred there and the effects carried on into the casting. A body of sand may have the right amount of water sprinkled on it, but if not cut over evenly and uniformly, parts of it will be too dry and other parts too wet. No worse sand ever went into a mold. Anything is likely to happen from it; falling out, cutting, washing, scabbing, blowing up, anything.

By the "body" of sand we understand its strength, its stability, which makes for its power to stick or hang together and to resist the heat and action of liquid metal. This body of sand constantly gets poorer and poorer with continued use, and should be constantly restored with new sand or sand rejuvenated. In adding new sand the best procedure is to add a small amount each day rather than let the sand pile go for a week, and then add it all at once. Nothing in molding is harder than to wet down and tem-

*All rights reserved. This series will be collected and published in book form. Parts 1, 2 and 3 were published in our issues of July, August, and September, 1925.

per cold dry sand, and no tempering is more unsatisfactory. Sand wet down and cut over when hot steams itself into condition much more satisfactorily than in the cold state. In tempering sand it should be cut over two or three times. No sand pile was ever properly tempered by one cutting over. Following cutting over, if the sand is sieved it will reach a much better condition. In wetting down sand for tempering, an effort should be made to wet the different sections or layers of dry sand, rather than to sprinkle over the top and then cut it over.

In sieving sand for the pattern in larger classes of work, the sand should be sieved on the floor and shovelled over the pattern rather than sieved over it. If sieved on the pattern rough and over-damp grains of sand roll around and against the pattern; the very place we do not want them. If sieved on the floor, these grains roll to the bottom edge of the pile and can be swept away. Frequently the effect of bad sand fail to show in the rough casting, but shows up in machining. Effects of agitation can be confined beneath a surface crust of congealing metal and escape detection. In the machine shop, however, they

show their defects and the casting has to be thrown away.

Different grades of work as well as different metals and their alloys require different grades of sand. The right sand for the right job, its permeability, its bond, its power to resist heat, its ingredients and their proportions, etc., constitute a study to which scientific effort is well addressing its powers. Agriculture has come to see that poor soil can be made good soil by a correction of its ingredients. Foundrymen have a similar possibility in their sand piles.

The subject is a large one and here it can only be noted in a practical and general way that openness and power to resist heat in sand should increase with the temperature of the metal, with its volume and with the expanse of mold surface over which the metal flows. Regarding the mold itself and its parts, openness, permeability of sand in any part should increase with the metal's approach to completely surrounding that part. A green sand core in a mold as against the outside walls of the same mold will illustrate.

This series will be continued in an early issue.—Ed.

Plating Automobile Parts for Service

From The Monthly Review, August, 1926

By EDWARD W. T. FAINT

Service in the sense meant by the title means exposed auto-parts that are plated with nickel and that will stay plated and give reasonable service.

What may be said is not by the way of criticism, but that during our discussion of the subject better methods than those now in general practice will be suggested, and result in decided improvement over what we now find on our standard finished jobs.

At present we are using the following methods:

STEEL PARTS

All steel parts are given a first-class polish in the usual way.

The parts are then cleaned by the use of boiling potash.

Electric cleaner (using the double throw switch).

Hydrochloric acid dip.

Water rinse.

Sodium cyanide dip.

Scouring when necessary.

Again thoroughly rinsed in cold water.

Plated in copper cyanide bath for 15 minutes.

Copper Solution (Cyanide)

Water	H ₂ O	1 gallon
Copper Cyanide	Cu(CN) ₂	3 ounces
Sodium Cyanide	NaCN	4 "
Sodium Carbonate	Na ₂ CO ₃	2 "
Sodium Thiosulfate	Na ₂ S ₂ O ₃ ·5H ₂ O	1/16 ounce
Temperature	140° F.	

After being plated 15 minutes in the copper cyanide bath the parts are removed, rinsed in cold water and transferred to acid copper solution.

Copper Solution (Acid Sulfate)

Water	H ₂ O	1 gallon
Copper Sulfate	CuSO ₄ ·5H ₂ O	25 ounces
Sulphuric Acid C.P.	H ₂ SO ₄	7 "
Temperature	70° F.	

Average time for copper plating in the acid bath 30 minutes. Work removed from acid bath is thoroughly

rinsed in cold water and dried by the use of boiling water.

Most of the parts can be copper-plated by the process outlined above, with the exception of some parts that have delicate edges or sharp points, or even fine threads on screws, bolts or nuts. These parts are plated in the copper cyanide bath only, and given a longer time in that bath.

After copper-plating all parts are buffed, inspected and only the perfect parts returned to the plating room to be nickel plated.

Nickel Plating

The parts having been copper buffed or colored, they are cleaned as previously described in preparation of the work for copper plating and placed in the nickel bath for 60 minutes.

Nickel Solution

Water	H ₂ O	1 gallon
Nickel Ammonium Sulfate	NiSO ₄ ·(NH ₄) ₂ SO ₄ ·6H ₂ O	8 ounces
Nickel Sulfate	NiSO ₄ ·7H ₂ O	4 "
Ammonium Chloride	NH ₄ CL	2 "
Boric Acid	H ₃ BO ₃	3 "
Nickel Chloride	NiCl ₂ ·6H ₂ O	1 "
Sodium Fluoride	NaF	1 "
Temperature	80° F.	

The parts receive a smooth, adherent, close-grained deposit of nickel in the above bath.

All parts after nickel plating are rinsed in cold water, heated in boiling water and dried.

Very careful attention is given to the final coloring after nickel plating, and then each piece is given a rigid inspection.

No claim is made for any originality in our methods, and furthermore we are certain that it is not a cheap method. Yet, as stated before, by the use of this method fairly good service has been obtained.

Shall We Have Chromium Plated Gold Jewelry?

An Explanation of the Dangers to Be Averted

By CHARLES H. PROCTOR

Plating-Chemical Editor

During the past three years a remarkable interest has been taken in chromium in the metal fabricating and electro-plating industries; more especially in the automobile industry.

The reason for the remarkable interest in the metal is the fact of its diamond-like hardness, its non-tarnishing qualities, under atmospheric conditions; its distinct color, bluish-white, and the fact that the metal can be deposited with an unusually bright lustre, under specific methods of electro-deposition, providing the article to be chromium plated are previously finished by the usual methods of polishing, etc., to the maximum lustre obtainable.

In the automobile industry chromium will no doubt find its greatest field of exploitation, as an electro-deposited metal for reasons heretofore stated. Chromium does not protect steel from atmospheric corrosion, which results in that great destroyer Rust, but will be used as a protective coating upon steel articles that have been previously polished to a lustre finish, electro-copper plated and nickel plated, with intermediate and final polishing operations. The steel articles so coated, when finally coated with a thin deposit of chromium metal with a high lustre, will give the purchaser of an automobile the greatest of satisfaction, because chromium will stay bright indefinitely and only requires to have its surface wiped dry with a soft cotton flannel cloth to retain its lustre. Chromium has many distinct advantages for the automobile industry and its use is being enlarged constantly.

The commercial deposition of chromium has been fully covered by an excellent article entitled, "A Summary of the Developments in the Electro Deposition of Chromium up to the Present Time," by Paul W. C. Strausser, Detroit, Mich., published in "The Monthly Review of the American Electro Platers," vol. XIII, July, 1926, pages 8 to 13, and The Metal Industry for September, 1926. During the past few years numerous other articles have appeared on this subject in The Metal Industry.

CHROMIUM ON JEWELRY

Chromium may be a dangerous factor in the jewelry industry in the hands of unscrupulous manufacturers of gold jewelry, who might see a splendid opportunity to make up a product of good design of a low karat yellow gold alloy, even as low as 8 karat, then plate it with a fairly good bright deposit of chromium costing a few cents, stamp it 18 karat and sell it to a consumer who would be innocent of the deception and purchase it as 18-karat white gold. The delusion would be complete because the nitric acid test often applied to articles made from karat golds above 8 karat would have no reducing action upon the chromium deposit any more than it does upon gold or platinum. Chromium is very resistant to the majority of commercial acids. Hydrochloric acid reduces it slowly. Nitric acid does not reduce it to any appreciable extent.

Chromium deposits then, unless specially guarded by the Jewelers' Board of Trade, would constitute a menace to the jewelry industry and the intrinsic value of gold, white gold and platinum used in the industry by reputable manufacturers who are at all times willing to stand back of the value of their products. This menace can readily

be discernible in an advertisement published in a well-known jewelers' trade paper.

The heading of the advertisement is "Let's Be Honest." Then the advertisement tells the retail jeweler: "You have in your stock quantities of yellow or green gold jewelry that you cannot sell. You cannot sell them because they are not white gold. The result is that you have to continually buy new goods to stay in business, while your old goods stick on the shelves. Now you can make that jewelry white and it will stay white." It does not need an expert to read between the lines that the purpose of coating the yellow and green gold articles is to sell them to the consumer as white gold, which would constitute deceit and possibly fraud. How can a retail jeweler using such methods be honest?

This advertisement indicates a possible menace to the legitimate trade and must be fully guarded against. It is of no use to enact laws such as the National Platinum Marking Act of 1926, which not only protects the consumer who pays the price for an article of a definite intrinsic monetary value, but also the legitimate manufacturer from the unscrupulous one who looks only to profit, and not to the standing of his product in the trade.

The Federal Trade Commissions has ordered a number of silver plated ware manufacturers to discontinue the use of the term "Sheffield," or the statement, "Manufacturers of Sheffield Plated Ware." Furthermore, the term Sheffield cannot be used in combination with any other word or words, signs or symbol or device to designate such silver plated ware, either by stamping or impressing the name "Sheffield" thereon.

The Federal Trade Commission has become aware that the name Sheffield has deluded the consuming public as to the real value of the product. Furthermore, the commission has added that the words Single, Double, Triple or Quadruple Plate must not be stamped or impressed upon silver plated ware unless they are actually plated with the amount of silver that has been standardized covering such designated terms by legitimate silverware manufacture for more than fifty years. Such a decision is eminently satisfactory and should apply to chromium plated jewelry made from karat alloys, whether yellow, green or white gold. The articles should be stamped, their respective alloy and its karat designation and a tag vouched for by the Jewelers' Board of Trade should be issued to the manufacturer desirous of coating his product with chromium or chromium alloy, stating that the product is quoted with chromium crodon or chromilite, as it may be, as a protecting factor against tarnishing and oxidation and to increase the wearing qualities of the article. The consumer would then be amply protected. The manufacturer would be honest in his dealings with the retail jeweler and the consuming public.

CHROMIUM PLATING FORMULAE

Chromium has no doubt a splendid field in the jewelry industry, but let its use be upon an honest basis. To those interested in experimenting with chromium in the jewelry line I give two formulae for solutions that are being used upon a commercial scale.

The first is known as the Bureau of Standards formula

It is used extensively in plating photo engraved copper plates, formerly plated with nickel and used in the Bureau of Printing and Engraving. The intense hardness of the chromium deposit has enabled the bureau of printing and engraving to print many hundreds of thousands more bills with the chromium plated copper plate, as compared with the nickel plated copper plate.

The second formula is known as the General Motors Corporation formula and is used for chromium plating steel auto radiator shells and various other automobile parts in their several plants.

The jeweler desirous of installing small test solutions upon a gallon or more basis can readily do so. The equipment necessary is identical with gold or platinum plating and should be arranged accordingly. The voltage, when used for a few minutes deposit, should average from 8 to 12. If the articles are to be plated longer than two or three minutes, then after they have been completely covered with the high voltage, 8 to 12 volts, it can be reduced 4 to 5 volts.

Articles to be chromium plated must be cleansed under usual conditions when used in connection with gold or platinum plating. One important factor, however, must be borne in mind: that the articles must be connected with the negative or plating current before they enter the solution, so that the chromium will deposit immediately upon the articles as they enter the solution. Furthermore, the solutions should be made up about two days before operation upon a regular commercial basis. Another advantage is to electrolyze the solution with two small anodes of

chromium, 2x3 inches, $\frac{1}{8}$ inch thick, for one or two gallons of solution. One anode should be placed upon the positive or anode rod and one on the work rod or negative. A current of 6 volts should be used for the purpose. If the solution is so electrolyzed intermittently for a day or two, more uniform chromium deposits will result.

Bureau of Standards Formula

Water, 1 gallon.

Chromic Acid, Cr_2O_3 , 32 ozs.

Chromic Sulphate, $\text{Cr}_2(\text{SO}_4)_3$ —4/10 oz.

Chromic Carbonate, CrCO_3 , 1 oz.

Voltage, 8 to 12 and 4 to 5; temperature, 110° Fah.

Anodes, pure sheet lead, which should be so arranged that the articles to be plated are completely surrounded by the lead anodes about 4 inches from the articles.

General Motor Corporation Formula

Water, 1 gallon.

Chromic Acid, Cr_2O_3 —28 ozs.

Chromic Sulphate, $\text{Cr}_2(\text{SO}_4)_3$ — $\frac{3}{4}$ oz.

Boric Acid, H_3BO_3 — $\frac{1}{2}$ oz.

Voltage and temperature as above.

Anodes, sheet steel or chrome steel, arranged as above.

The amperage required per square foot of surface area to be plated is 150 amperes minimum.

The solution should be prepared by dissolving all the chemicals mentioned in boiling hot water in the order given. Then allow the solution to cool down to a temperature of 110° Fah. before using.

If You Buy Solder and Babbitt Metal

An Interview with W. J. BOARD of the Eagle Picher Lead Company, Joplin, Mo.

By RUSSELL RAYMOND VOORHEES

Solder and babbitt metal may not be the biggest things that a purchasing agent buys, but nevertheless there are some facts about both of them that he would do well to remember. There is some buying "dope" that he can paste in his hat for reference when the time comes for him to make another purchase.

The Eagle Picher Lead Company of Joplin, Mo., has one of the largest smelters in the world. They know lead, zinc, solder and babbitt.

"The first thing to remember in buying either solder or babbitt is to look at the name of the manufacturer," says W. J. Board of the Eagle Picher Lead Company, in discussing how to buy these two items. "If the solder or babbitt is made by one of the leading and well known manufacturers the buyer need have no fear about the content of it and about the price. The overhead cost and labor cost of making solder and babbitt is small, the chief item of cost being the metal itself. Such being the case, it naturally follows that the well known manufacturers will all sell their output at practically the same price since the metal market is the basis for figuring prices.

"However, there are a few small manufacturers who manufacture solder and babbitt from scrap metal and while their prices may not always be much cheaper the character of their article may be far from acceptable. So the first consideration, then, is to look hard at the solder or babbitt of a manufacturer who isn't well known. It may be that his product is all right—and then again it may be that it is not.

"Since overhead and labor enters into the manufacture of solder and babbitt only to a limited extent it naturally follows that the price of the finished product will very closely follow the metal market. That is, the daily market prices for the various metals used in making solder and

babbitt will, when taken according to the percentage of content of each metal in the solder or babbitt, give a fairly true indication of what the price should be. Of course, there will be a little variation but this differential will be found to be almost constant with all manufacturers. By using this differential as a guide, it will be an easy task to figure out how much off the low prices that are offered really are.

If they vary to any extent it is a pretty safe guess that scrap metal has been used in the manufacture of the low priced solder and babbitt.

"The poorest economy that can be followed is to try to save money by buying poor solder and babbitt. When scrap metal is used in the manufacture of these metals trouble is bound to follow. In the case of babbitt a little trouble may mean a lot of lost time and money. Frequently an hour's shutdown of a machine will completely throw out production all over a factory. In such a case a few cents that were saved by buying babbitt of inferior quality is lost many times over in lost production. There is nothing quite so valuable in a factory as machine hours. Poor babbitt metal and the initial saving in money that it affords is as nothing in comparison to these lost machine hours. And what is true of babbitt is also true of solder. The saving over a year is so slight and the hazard so great that it is unwise to take the risk. So in buying either solder or babbitt, the first thing to look for is the name of the manufacturer. That may be proof of worth. Then if the price is too low on some offering of rather unknown make, the buyer should beware. An analysis may tell whether scrap metal has been used, but if such a procedure is not desired then the best thing to do is to forget the small money saving and play safe by buying only solders and babbitt of known make."

THE METAL INDUSTRY

With Which Are Incorporated

THE ALUMINUM WORLD, COPPER and BRASS, THE BRASS FOUNDER and FINISHER
THE ELECTRO-PLATERS' REVIEW

Member of Audit Bureau of Circulations and The Associated Business Papers

Published Monthly—Copyright 1926 by THE METAL INDUSTRY PUBLISHING COMPANY, Incorporated

Entered February 10, 1903, at New York, N. Y., as second class matter under Act of Congress March 3, 1879

SUBSCRIPTION PRICE, United States and Canada \$1.00 Per Year. Other Countries \$2.00 Per Year : : SINGLE COPIES, 10 CENTS
Please Remit by Check or Money Order; Cash Should Be Registered

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Palmer H. Langdon.....Editor and Publisher
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ADDRESS ALL CORRESPONDENCE TO
THE METAL INDUSTRY, 99 JOHN STREET, NEW YORK
Telephone Number: Beekman 0404. Cable Address: Metalustry

Vol. 24

New York, October, 1926

No. 10

Contents

American Foundrymen's Convention	401	Shall We Have Chromium Plated Gold Jewelry?..	419
A Report of the Joint Meeting of the American Foundrymen's Association and the Institute of Metals Division, Held in Detroit, Mich., September 27-October 1, 1926.		An Explanation of the Dangers to be Averted By CHARLES H. PROCTOR	
Bronze-Welding Copper	408	If You Buy Solder and Babbitt Metal.....	420
This Operation Usually Gives Ample Strength and Tightness for Ordinary Commercial Work.		An Interview with W. J. Board of the Eagle Picher Lead Company, Joplin, Mo. By RUSSELL RAYMOND VOORHEES	
Temperature Determination in the Metal Foundry	409	Editorials	422
A Symposium Held at the Convention of the American Foundrymen's Association, Detroit, Mich., September 27-October 1, 1926.		Foundrymen's Convention. Growth of the Metal Industries. Biennial Foundry Exhibits. Welded Steel Structures.	
A Thermo-Couple for Ladle Temperatures of Brass	409	New Books	423
By A. A. GRUBB, L. H. MARSHALL and C. V. NASS		Technical Papers	
Pyrometer Control in a Brass Foundry.....	410	Shop Problems	
By ANDREW S. HALL		Patents	
The Use of Pyrometers in the Casting of Non-Ferrous Metals	412	Equipment	428
By R. D. BEAN		Metal Parts Washing Machine. New Acetylene Generator. New Suction Torch. Automatic Polishing Machines. Tank Rheostats. Aluminum Alloy Nails.	
Temperature Control in the Brass Foundry.....	413	Association and Societies	431
By H. M. ST. JOHN		Personals	
Visual Judgment of Non-Ferrous Metal Temperatures	415	Obituaries	434
By R. R. CLARKE		News of the Industry	
Type Metal Mixtures	416	Review of the Wrought Metal Business.....	441
By W. J. REARDON		Metal Market Review	
Brass Cutting Compound	416	Metal Prices	
By P. W. BLAIR		Supply Prices	
The Fundamentals of Brass Foundry Practice....	417		
A Description of the Basic Laws Which Control the Melting and Casting of Metals and Their Application to Practical Foundry Operations. Part 4. By R. R. CLARKE			
Plating Automobile Parts for Service.....	418		
By EDWARD W. T. FAINT			

Buyers' Guide—Advertising Page 77. Edition this month, 6,000 copies

EDITORIAL

FOUNDRYMEN'S CONVENTION

The 30th Annual Convention of the American Foundrymen's Association and the International Foundrymen's Congress, with which was held the annual meeting of the Institute of Metals Division, broke all records. Over 80,000 ft. of floor space were occupied and about 6,000 visitors and members were registered.

The character of the meetings of the Institute of Metals was essentially practical, to conform with the type of work carried on by the Foundrymen's Association. It has become the policy to reserve the more scientific and abstract papers for the winter meetings held in New York. Those papers which attracted unusual attention were Aluminum Castings of High Strength, by Archer and Jeffries; Aluminum Alloy Permanent Mold Castings, by Anderson; Exudations on Brass and Bronze, by Price and Phillips; The Symposium on Temperature Determination and, of course, the talk by Dr. Guertler on Silver Alloys.

The annual feature of these meetings, the Round Table on Brass Foundry Topics, was as successful as ever, in spite of the difficulties under which it was carried on. It is to be hoped that plans will be made in the future to hold this luncheon at a hotel rather than at the convention grounds as the mechanical problems will be greatly

simplified. The questions brought up for discussion were typical of brass foundries and their troubles, covering the use of nickel in brass; the comparative effects of dry and green sands; high lead brass and bronze; the use of scrap versus virgin metal, and fluxes for turnings, borings, etc. Old as these questions seem to be, there is always something new to be said about them every year. Visitors are well repaid for their efforts by the open and unrestrained discussions which are the rule at these round tables.

A new feature was a Symposium on Temperature Determination in which representatives of pyrometer manufacturers and brass founders joined. The papers and the discussions which followed were eye-openers for the visitors. Although the last word has not yet been said on pyrometers, foundrymen are rapidly approaching a clear idea as to the true value of these devices in practical operation. Year by year they are steadily growing in favor, but it is stated freely, not only by foundrymen but by the manufacturers as well, that the pyrometer must be guided by intelligence; that it is only a tool and not at all infallible. Badly handled, it can cause considerable trouble. Properly handled it can be of the greatest assistance.

GROWTH OF THE METAL INDUSTRIES

A striking comparison of the iron production of the world and non-ferrous metals was shown by Dr. Zay Jeffries in a recent lecture on metals delivered at the annual meeting of the American Society of Mechanical Engineers.

The world's production of pig iron grouped in periods of five years, rose steadily from 112,000,000 tons in 1885 and 1889 to 344,000,000 tons in 1919-1914. The following five-year period showed a decline to 326,000,000 tons, and the last five-year period, 1920-1924, showed another decline to 275,000,000 tons.

The non-ferrous metals have risen from 5,650,000 tons in 1885-1889 to 17,800,000 tons in 1915-1919. The production of last five-year period showed a decline to 15,700,000 tons.

By comparison with the iron and steel industry, non-ferrous metal trades seem almost insignificant, but a comparison of values would make up for part of this difference. The significant feature of these figures, however, is not in the tonnages involved but in the comparative growths. The iron and steel output tripled between 1885 and 1914. Non-ferrous metals increased by about 2.85 times. In the following five-year period iron and steel fell off to 2.8 times its 1885 record, while non-ferrous metals climbed to 3.15. In 1920-1924 steel dropped still

further to 2.45 and non-ferrous metals, although they receded, stayed at about 2.80.

Phrased differently, in 1885-1889 about 5 tons of non-ferrous metals were produced for every 100 tons of iron. In 1910-1914 the ratio was about 4.7 to 100. In 1915-1919 it was 5.46 and in 1920-1924, 5.7. Subsequent figures not included in the above show that in 1924, 6.44 tons of non-ferrous metals were produced for each 100 tons of pig iron.

The important conclusion which stands out is that although non-ferrous metals are small in quantity compared to iron and steel, their use is growing faster. This bears out the general impression that we have entered into an age of alloys and that in spite of the unremitting efforts to achieve production at high speed and low cost, the features of quality, wearing ability, appearance, etc., are not being neglected; in fact, receive more and more attention.

Adding to this the realization of the enormous losses because of corrosion and the steadily widening attacks on this enemy, we have a future for non-ferrous metals which seems to be assured. In a general way it can be said that metals, properly chosen, will be more corrosion resistant than iron and steel, although the stainless steels are perhaps an exception to this rule.

BIENNIAL FOUNDRY EXHIBITS

The recent announcement of the American Foundrymen's Association of a change in policy with regard to foundry exhibits, should settle for some time to come, a problem which has long been growing on the foundry equipment industry. Exhibitions of foundry supplies and machinery have been held every year together with the meetings of the American Foundrymen's Association. In many cases the equipment shown was large and complicated. It had to be shipped long distances and set up, then dismantled and shipped back. A large crew of men was required for this work and as a result the costs involved became almost prohibitive. According to rumor, some of the manufacturers spent as much as \$20,000 for this convention alone. Add to this the fact that there were other conventions and exhibits of interest, and we have a condition which is rapidly becoming impossible. There were too many conventions, too many exhibits, and they cost too much, both in time and in money.

The American Foundrymen's Association has taken the first step to meet this situation, by revising its schedule. In the future, exhibitions of equipment will be held every two years instead of every year, as in the past. Technical meetings will continue to be held every year. To solve the problem of supporting these technical meetings, which has been done in the past through the receipts from the exhibitions, it was decided to increase the cost of space occupied by the exhibitors. This increase, however, will be willingly met because it is a very small item in the total cost of exhibiting at a convention, and the saving in holding these exhibits only every two years will make up for it many times.

The American Foundrymen's Association is to be congratulated for a brave and progressive step. It should not be viewed as a retreat, but rather as an honest

acknowledgment of a difficulty which had to be remedied. The thoughtful consideration for those who have supported its meetings will not go unappreciated or unrewarded.

WELDED STEEL STRUCTURES

A new method of steel construction will interest every metal factory and building owner who is contemplating additions. An announcement from the Westinghouse Electric and Manufacturing Company tells of letting contracts for the erection of two structural steel buildings on that company's properties, to be assembled by arc welding instead of riveting.

One of these will be a five-story mill building for the manufacture of transformers. It will be the largest arc welded or rivetless building in the world, and the first practical application of arc welding to multiple story structures. All the joints and members will be arc welded.

The other building, a one-story structure will be erected partly of scrap roof trusses, something economically unfeasible heretofore. It is claimed that arc welding, tested co-operatively by the American Bridge Company and the Carnegie Institute of Technology, Pittsburgh, resulted in joints which are stronger and more resistant to pressure and stresses than riveted joints. Steel is saved because plates and angles necessary in riveting buildings can be omitted and because lighter beams can be used.

Methods of assembling steel structures will of course, be changed but there is no reason why these changes should be difficult in any way. It seems that the development of welded steel structures, now of course only in its infancy, is one of the outstanding industrial possibilities.

New Books

Commerce Year Book, 1925. Published by the Department of Commerce, Washington, D. C. Price, \$1.00. For sale by the Superintendent of Documents, Government Printing Office, Washington, D. C.

The Commerce Year Book is a concise but complete review of American trade and industry. It is offered as a valuable source of reference on all branches of American business. The gathering and collating of material contained in it represents months of work by experts. The facts contained therein have been carefully edited and its figures are of course authentic and reliable.

The contents of this book include a resumé of production, employment, domestic trade and prices. Sections devoted to agricultural products and foodstuffs; fuel and power; metals; construction and construction materials; machinery; motor vehicles; railway equipment; electrical apparatus; textiles; rubber; leather and leather products; paper and printing; chemicals; discussions of transportation and communication; finance and banking; foreign trade; economic surveys of the principal foreign countries.

Chemistry in the World's Work. By Harrison E. Howe.

Published by D. Van Nostrand Company. Size 5½x8½, 244 pages. Price, payable in advance, \$3.00. For sale by THE METAL INDUSTRY.

Dr. Howe, who is editor of Industrial and Engineering Chemistry, is an authority on chemistry and is eminently fitted to write a book of this sort. This book is one of the Library of Modern Sciences, a popular series treating of their influence on the development of civilization. The object is therefore to tell in non-technical language the part which chemistry has played in assisting in the attainment of our present civilization.

* The author discusses the various fields in which chemistry has shown its importance and a glance at the following chapter headings will give the reader an idea of the scope of the book: Solitude; Mental Isolation; Allies of the Sun; Food and Famine; Contributions of Chemistry to Cloth and Clothing; Decoration-Escape from Monotony; Metals, the Master; Materials of Construction; Permanency of Possessions; Health and Sanitation; Power; Abolition of Drudgery; Chemistry in National Defence; Chemistry, a Tool; Analysis and Synthesis; The Trend and Purpose of Modern Research.

Technical Papers

A Study of Sieve Specifications. By Lewis V. Judson.

An account is given of a study made on sieves tested at the Bureau of Standards. The investigation showed the desirability of changes in the specifications for the United States Standard Sieve Series. As the wire diameter appeared to have only a second order effect in actual sieving, the tolerance in wire diameter was made very liberal. The relation of other measured dimensions of sieve cloth to the sieving results is also discussed. The revised specifications are given in Letter Circular No. 74.

Relatively Fine-Grained Deposits from "Unsatisfactory" Electrolutes*. By E. A. Vuilleumier.

By coating the cathode with a film of glycerine, sugar solution, or even water, relatively dense, smooth, adherent deposits are obtained from solutions which normally give rise to very "unsatisfactory" deposits. This is probably due to the formation of many nuclei in the early stages of deposition.

Electrical Resistivity of Aluminum-Calcium Alloys*. By Junius D. Edwards and Cyril S. Taylor.

The electrical resistivity and density of a series of cast and rolled aluminum-calcium alloys, containing up to 3 per cent calcium, have been determined. The addition of 3 per cent calcium increases the resistivity of rolled aluminum from about 2.70 to 3.30 microhms-cm. The structural arrangement of the aluminum-calcium consistent in the cast alloys satisfactorily explains their somewhat higher resistivity.

Refractories for Induction Furnaces*. By M. Unger.

The requisites for a commercial furnace lining of induction furnaces are detailed and discussed. Of the various materials studied, magnesium oxide proved to be the one refractory more nearly fulfilling the conditions than any other. Proper grading of the magnesium oxide is very important. Pitch was selected as the best bonding material. For continuous operation on steel and a slag analyzing 20 to 25 per cent silica, the magnesium oxide lining will last through 400 heats.

Voltage Studies in Copper Refining Cells*. By Colin G. Fink and C. A. Philippi.

Anode and cathode polarization and IR drop through the copper electrolyte were determined under varying conditions of temperature and composition of electrolyte. Results indicate the importance of studying and controlling the voltage at both cathode and anode surfaces, and not merely considering the IR drop through the electrolyte, as has been common practice in the past, to arrive at the most efficient refining operating conditions.

Metals to Resist Corrosion or High Temperatures*. By H. J. French.

A discussion is given of some of the principal characteristics and typical applications of metals used industrially to resist high temperatures or corrosion. Those considered include commercially pure copper, aluminum, lead, tin, silver, nickel and iron, and alloys in which these are the predominating elements. The report is primarily a résumé of previously published but widely scattered information, and emphasis is placed upon industrial applications.

Acid Zinc Plating Baths*. By M. R. Thompson.

In a study of acid zinc plating baths, it was not found possible to increase materially their throwing power, chiefly because of the low cathode polarization which they possess. It was found, however, that simple baths of much higher conductivity than those commonly used may be prepared, in which satisfactory deposits can be produced at unusually high current densities. Such baths may contain a moderate concentration of zinc chloride (e. g. 2 N); a high concentration, e. g. 3 to 4 N of sodium or ammonium chloride, and a small concentration, e. g. 0.25 N of aluminum chloride. These baths operate best at a pH from 3.5 to 4.5.

Cadmium: Its Electrodeposition for Rust-Proofing Purposes*. By C. M. Hoff.

The physical and chemical properties of the metal, cadmium, are described. A comparison of these with similar properties

of zinc indicates that cadmium should be a better rust protecting plate than zinc, because it is less active chemically, but at the same time protects iron electrochemically, forms a protective oxide film, is not amphoteric in character and although softer than zinc is more ductile. A solution has been developed which will deposit cadmium in a dense, ductile, adherent, bright form over a wide range of current densities, is in equilibrium with the anodes, is self-sustaining, has low resistance, high throwing power, and will accommodate high current densities. Thin deposits of cadmium effect comparatively great rust resistance; the time of deposition is short, which enables increased production to be obtained with plating equipment with lowering of costs. The properties of cadmium and its method of electrodeposition are such that it has a definite place in the field of rustproofing, for which it is better suited than zinc. It combines attractiveness of finish with rust resistance, and a knowledge of the properties of cadmium indicates its proper application.

Refractories for Melting Pure Metals: Iron, Nickel, Platinum*. By Louis Jordan, A. A. Peterson and L. H. Phelps.

The Bureau of Standards has carried out a very systematic investigation of the refractory materials best suited for the melting of pure iron, nickel and the platinum metals. The nature or composition of the pure metal or alloy to be melted, and the conditions under which it is required or is convenient to melt it, must be known before a proper choice of refractory for holding the molten mass can be made. Pure magnesia crucibles are suitable for pure iron and iron alloys, but usually the magnesia crucibles contain too much sulfur, readily absorbed by the iron. Zircon added to the magnesia greatly increases the strength of the crucibles. The zircon must be low in phosphorus. Pure iron melted in zirconia crucibles was found to have taken up large amounts of silicon. Crucibles made of "R R Alundum" contaminated the iron by as much as 0.07 per cent silicon. Crucibles made of c. p. MgO with MgCl₂ as binder proved to be most satisfactory for pure iron and iron alloys. The making of these MgO crucibles is described. These crucibles are likewise best suited for melting pure nickel. Crucibles made of zirconia, freed from carbon and acid-soluble iron, are suitable for melting pure platinum and platinum-rhodium alloys, providing the melting is done under oxidizing conditions. The manufacture of zirconia crucibles is described. They are very hard and mechanically strong. They withstand temperatures up to 2,000° C., but must be heated and cooled slowly.

The Common Properties of Addition Agents in Electrodeposition*. By Giichiro Fuseya and Kwanji Murata.

The authors review the various theories that have been proposed to account for the beneficial effect on the cathode resulting from the addition of glue and other substances to the electrolyte. They then describe in detail experiments made with copper sulfate and with silver nitrate baths, tabulating the results obtained with a large variety of substances introduced into the electrolytes. Among other things, it was found that those substances which increased the weight of the cathode deposit tend to reduce the size of the crystals in the deposit, whereas substances which do not vary the crystal size cause no increase in the weight of the deposit for the same amount of current. The formation of complex ions upon the addition of various substances to the electrolyte was carefully investigated by electromotive force and ion migration measurements. The experiments showed that both copper and silver formed complex ions with metaphosphoric acid, tartaric acid and glycolic acid, which are positively charged. In general, oxy-acids and amino-acids have the common properties of forming complex cations with copper or silver ions. These are the very substances which entered into the cathode deposits and caused the crystal size to be smaller. On the other hand, sugars and the higher alcohols do not form complex ions with copper or silver, or do so only to a slight extent, and these substances do not in any way or only very slightly affect the cathode deposit. There appears to be a close relation between the property of forming complex ions and that of diminishing the size of the cathode crystals.

* Abstract of paper presented at the Fiftieth General Meeting of the American Electrochemical Society, held in Washington, D. C., October 7, 8 and 9, 1926.

SHOP PROBLEMS

IN THIS DEPARTMENT WE ANSWER QUESTIONS RELATING TO SHOP PRACTICE

ASSOCIATE EDITORS { JESSE L. JONES, Metallurgical
WILLIAM J. PETTIS, Rolling Mill

W. J. REARDON, Foundry.
W. L. ABATE, Brass Finishing.

CHARLES H. PROCTOR, Plating Chemical
P. W. BLAIR, Mechanical

CASTING YELLOW BRASS

Q.—I am sending you under separate cover some yellow brass castings showing you how we gated same. As you can see, we are getting very poor castings. The formula we use is 68 lbs. copper; 29 lbs. spelter; 4 lbs. lead. The customer we are making these castings for said that he wanted a free cutting yellow brass with the addition of 4 lbs. lead per hundred lbs. Also there must not be any iron or aluminum used.

Am sending a sample of your spelter to be analyzed as we think it is a very poor grade.

A.—We received the sample castings and on examination we find one of your troubles is due to wet sand, as the castings show scabs. For yellow brass mixture it is not necessary to use your sand wet, but as dry as is consistent to work. Your gating is not bad and the only impurity you can have in your spelter would be lead, and as you are adding lead this would not be detrimental.

We suggest you skin dry the molds. This will eliminate most of your trouble. A very good way and fast one, that will not interfere to a very large extent with production, is to leave the molds open until you are about to pour and dust the mold with a very fine rosin through a parting bag; then take a torch and burn the rosin. This leaves a good skin on the mold and also smokes the mold, and the metal will run sharper and cleaner, and will eliminate scabs and cold shots if the mold is at fault. It is always necessary to pour your casting at the proper temperature and in a mixture such as yours, use not over a No. 50 crucible. Problem 3,565.

CORES FOR PHOSPHOR BRONZE

Q.—We are inquiring as to the proper core mixture and core wash for bushings of phosphor bronze and regular bearing metal.

Our difficulty has been with metal eating into the cores. We have used plumbago dressing, which does not entirely eliminate our difficulty, leaving castings very rough after the core has been removed.

A.—We suggest a sand mixture as follows:

- 5 pails of silica sand.
- 1½ pails of old molding sand.
- 3 quarts of core oil.

Blacken the core with core wash and then take black lead and wet with gasoline and rub the core by hand. This will eliminate your trouble with rough castings inside the core parts.—W. J. R. Problem 3,566.

HIGH TENSILE BRASS

Q.—Would you kindly advise us of a mixture of bronze to test 45,000 lbs. tensile strength. Also advise us as to how to mix same and temperature to be poured at.

A.—The following mixture will give over 45,000 tensile strength: 58½ copper, 41 zinc, 1½ aluminum. Melt the copper, get it good and hot; add the zin a little at a time and stir well. Then add the aluminum. Take a sample of the metal out of the pot before pouring in mold and pour in a thin strip and test the metal for toughness. If the metal is mixed right it will be very strong. If not, stir, and add 1 per cent more copper. However, if you weigh your mixture correctly and follow instructions you should get 65,000 tensile. Use risers on heavy parts and also give the metal as long a run as possible before entering the mold and gate from the bottom whenever possible. This mixture is similar to manganese bronze.—W. J. R. Problem 3,567.

OXIDIZED SILVER ON BRONZE

Q.—Will you please give me the following information. Am finishing small bronze castings in oxidized silver and have been

using sulphuret as an oxidizing agent, but find it necessary to deposit much more silver than I care to, in order to avoid cutting through to the bronze. Could you recommend a dip or black plate of some kind that is more easily removed? The type of work I refer to has many square edges and high points and my trouble of cutting through the silver has been on these highlights.

A.—We suggest that you nickel plate the bronze castings first for a short time before silver plating. If the silver should be cut through the nickel deposit will show a white background. If you nickel plate the bronze castings then it will be necessary to use a silver strike solution to coat the nickel over quickly with silver before placing in the regular silver solution. The strike solution should be made up as follows:

Water	1 gallon
Sodium cyanide .96-98%	6 ozs.
Silver cyanide	¼ oz.
Caustic potash	¼ oz.

Use sheet steel or nickel as anodes. Voltage 5 to 6. After silver plating the articles, flash them for a moment in a weak but hot copper cyanide solution to give a thin copper deposit. Immerse them in a cold liver of sulphur or polysulphide solution based upon the following proportions.

Water	1 gallon
Liver of sulphur or polysulphide	¼ oz.
Ammonium sulphate	¼ oz.

Immerse the articles in the solution until they become blue black, then wash and immerse in boiling water and finish as usual. The advantage of using a thin deposit of copper is that a much weaker oxidizing solution can be used. The sulphur acts only on the copper so a much thinner deposit of silver can be applied.—C. H. P. Problem 3,568.

PITTED NICKEL AND COPPER

Q.—We are having trouble with our nickel solution, and we would like to know if you can help us. When we put a radiator shell or coffee urn in to plate, if we have the flat surface up after it is run any length of time, the work will be pitted. We note that this does not happen if the work is plated up and down. We are also having the same trouble with our acid copper solution. If we plate a shell or bumper bar face up the work after it comes out of the solution will be pitted on the flat surface. We think that it is something that settles on the top of the solution as we do not get this result on the middle or bottom of the work.

A.—Pitting develops more or less in nickel solutions, sometimes quite badly. In acid copper solutions, very little pitting should result. You do not mention what method you use in basic coating the steel auto bumpers or radiator shells. If you deposit nickel first before acid copper plating, then you may have pitting in the nickel deposit which would show up in the polished copper surface. It may possibly be dust that causes your trouble in acid copper plating, but it is hydrogen gas that produces pitting in the nickel deposits. You can overcome the pitting of the nickel deposits by additions of hydrogen peroxide to your nickel solutions; the regular commercial article can be used. It will require a minimum of ¼ oz. fluid measure per gallon of nickel solution to reduce the pitting, perhaps more.

Sodium perborate can be used as the hydrogen pitting controlling factor. This material when dissolved in warm water 120° F. and then finally acidulated with hydrochloric acid to equal the acidity of the nickel solution that is pitting. Dissolve 1 lb. of sodium perborate in 1¼ gallons of hot water as outlined, then add sufficient hydrochloric acid to acidify the solution. Add 1 quart per 100 gallons of nickel solution and repeat at intervals until pitting ceases. To your acid copper solution, add about 2 ozs. hydrochloric acid per gallon of solution and ¼ oz. yellow Dextrine previously dissolved in hot water per gallon.

Try these additions in a 10 or 20-gallon trial solution. We believe the hydrochloric acid will give the best results. The chlo-

rine evolved from the acid may control the small amount of hydrogen deposited with the copper better than sulphuric acid. However, you can make a trial test with both acids and note which gives you the best results.—C. H. P. Problem 3,569.

RED BRASS PLATE

Q.—What is a good formula for electroplating a red brass finish?

A.—The following formula will give a red brass or bronze deposit.

Water	1 gallon
Sodium cyanide	96-98%—7½ ozs.
Copper cyanide	4 ozs.
Zinc Cyanide	1 oz.
Bisulphite of soda	2 ozs.
Hypsulphite of soda	1/64 ozs.

To prepare the solution, dissolve the sodium, copper and zinc cyanides in half gallon of water at 140 deg. F. When dissolved add the balance of the water, cold, to make up the gallon of solution, then add the bisulphite and hypsulphite of soda. Anodes should consist of an alloy of 90 parts copper, 9 parts zinc, 1 part tin.

In plating cast iron, first copper plate the iron to cover it uniformly before bronze plating, or nickel plate the iron. Add no ammonia to the solution unless the bronze color is too red. Then add ¼ oz. of sal-ammoniac per gallon of solution or more as required.—C. H. P. Problem 3,570.

RUST PREVENTIVE

Q.—We are looking for a substance to put on cold rolled strip steel to prevent rusting. Oil is too slippery to handle, and the substance must not be injurious to the workman's hands. The blank parts made from this steel have to be handled rapidly, and we need a coating to counteract the perspiration from the workman's hands.

A.—One of the best factors to coat steel with even a minute film to protect it from corrosion is a good floor wax. You can dilute this material with trichlorethylene which will aid in its drying qualities. Or you can prepare a rust resisting factor by mixing China wood oil, known also as Tong oil, with the trichlorethylene in proportions of 1 to 2 parts oil to 8 to 16 parts (tri) or as may be required. Either method should give you the desired results.

In further reference to sodium sulphate solutions, a patent was granted covering specific methods of using the material. We shall try and locate this patent and shall then advise you of the patent number, etc. You can purchase a copy for ten cents from the Patent Office, Washington, D. C.—C. H. P. Problem 3,571.

SHOE BUCKLE METAL

Q.—I am in charge of a novelty company and am making rhinestone shoe novelties such as shoe buckles, bar pins, etc. We use that metal soft as lead. It is not lead, but some sort of composition. Sometimes it comes out dark, sort of black. I would like to know what to put in the hot metal when casting to make it come out bright.

A.—All this class of novelty work and hardware such as casket trimming, etc., are made in four grades of white metal known as hardware babbitt Nos. 1, 2, 3, 4. This metal is made generally from antimonial lead, which contains approximately 77 lead, 20 antimony, balance copper, tin and arsenic. No. 4 is made from this alloy without adding any other metal and is dark in color.

No. 1 contains approximately 20 tin.

No. 2 contains approximately 21 tin.

No. 3 contains approximately 5 tin.

We would think you are using No. 3, as you say it is soft as lead, so to brighten the collar add 1% tin. If not white enough add more tin until you get the desired color. Also do not pour your work too hot.—W. J. R. Problem 3,572.

SILVER PLATING OVER SOLDER

Q.—In the plating of musical horns I have trouble in covering solder. It comes out of the cleaner O. K. but going through the bright dip oxidizes the solder which I cannot plate over. The only way I can cover the solder is to scrub with pumice stone. I would like to know if there is some dip to remove the oxide from the solder without all this scrubbing. It is my silver tank only. First I put it through the cleaner; bright-dip; then rinsing tank, and swill it in cyanide. Then I mercurialize, rinse and scrub well; then put in silver strike, plate for two hours at one and a half volts; then scratch brush and the solder shows up.

A.—Unfortunately there is no dip available that will remove the dark discoloration from the soft solder which you term an oxide that results from acid dipping of the band instruments you finally silver plate. If you want to dispense with pumice stone then purchase some hand scratch brushes made of crimped brass wire. You can brighten the solder in an instant with such a brush and the result will be a better surface upon which to plate. Some firms in your line give the brass instruments a flash of copper after acid dipping to cover up the solder. The copper solution should be used hot. The following formula will answer your purpose.

Water	1 gallon
Sodium cyanide 96-98%	2½ ozs.
Copper cyanide	1½ ozs.
Bisulphite of soda	¾ oz.
Caustic soda	¼ oz.

Temp. 140-160 deg. F. Use copper anodes.

To prepare the solution, dissolve the cyanide in 1 quart hot water then add the copper cyanide; the balance of the water, then the bisulphite of soda and caustic soda. Stir well and the solution is ready for use. To brighten the copper, add 1/32 oz. or less per gallon of hypsulphite of soda. Do not add more.—C. H. P. Problem 3,573.

TINNING ROUGH BRASS

Q.—Please let us know if you have a book on cleaning and tinning rough brass castings. We would also like to know a solution for cleaning rough brass casting ready for tinning and a good flux to use for same.

A.—For complete, authentic and practical working data covering the hot tinning process for all metals, look up a copy of *Galvanizing and Tinning* by Flanders, latest edition.

Brass castings are more easily tinned than iron or steel castings. The following procedure will enable you to tin brass castings.

1. Remove all sand from the castings by pickling in a pickle composed as follows: Water 1 gallon; hydrofluoric acid commercial, 24 ozs. Temperature 120 deg. F. This pickle will remove burnt sand, etc., in a very short time.

2. Wash thoroughly in cold water, then immerse in the following acid dip which should be prepared the day previous to using so that it regains normal temperature.

Nitric acid 38°	2 gallons
Sulphuric acid 66°	1 gallon
Water	1 pint
Muriatic acid	1 oz.

Mix in the order given; add acids very slowly.

3. After acid dipping, wash thoroughly in cold water then immerse direct in the flux prepared as follows. Dissolve all the sheet scrap zinc that commercial muriatic acid will absorb. Add slowly to avoid boiling over. When the acid becomes saturated, let it cool down to normal and then filter through cheese cloth to remove insoluble matter.

To the solution so prepared, add all the white sal-ammoniac it will take up; 1 lb. or more per gallon. The flux is then ready for use. Immerse the castings as mentioned, then drain well and immerse direct in the molten tin bath until uniformly coated with tin. Remove and cool in water or paraffin, or kerosene oil. Pure straits tin must be used. Heat in iron kettles to 600 deg. F. for best results. The molten tin should be covered to ½ inch depth with palm oil or tallow. The castings coated with tin as outlined will be smooth and bright. It requires some practical knowledge to produce the best results.—C. H. P. Problem 3,574.

PATENTS

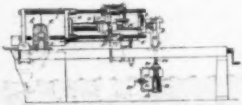
A REVIEW OF CURRENT PATENTS OF INTEREST

1,596,020. August 17, 1926. **Aluminum Alloy.** Aladar Pacz, Cleveland, Ohio, assignor to The Aluminum Company of America, Pittsburgh, Pa.

The method of making aluminum base alloy castings comprising preparing an alloy containing not less than about 3 per cent nor more than 15 per cent of silicon, treating the molten alloy with a reagent containing an oxygen-containing compound of an alkali metal capable of being reduced in the molten alloy, and causing the alloy to solidify while it still contains sufficient of the reduction products to produce an improvement in the physical properties of the alloy.

1,596,150. August 17, 1926. **Die-Casting Machine.** George W. Bungay, Plainfield, N. J., assignor to Aluminum Die-Casting Corporation, Garwood, N. J.

In a die-casting machine, a die comprising a pair of die sections one of which is movable, fluid-pressure means adapted to move one of said sections into intimate engagement with the other, and fluid-pressure means adapted to lock one of said die sections in engagement with the other.



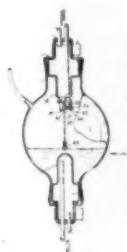
1,596,253. August 17, 1926. **Method of Separating Cobalt from Nickel.** William J. Harshaw, Shaker Heights Village, Ohio, assignor to The Harshaw, Fuller & Goodwin Company, Cleveland, Ohio.

In a method of separating cobalt from nickel, the step which consists in electrolyzing a soluble lead compound present in a solution of salts of said first-named metals, whereby lead dioxide is formed, the latter thereupon reacting with the cobalt to form cobaltic hydrate.

1,596,300. August 17, 1926. **Metal-Coated Metal Articles and process of Making Same.** Spencer Otis and Wilson T. Herren, Barrington, Ill., assignors to National Boiler Washing Company of Illinois, Chicago, Ill.

A ferrous metal article coated with lead there being an intermediate film between the coating and article of tin and cadmium.

A process of coating ferrous articles with lead which consists in first electro-depositing thereon a film comprising tin and cadmium and then applying a coating of lead.



1,596,306. August 17, 1926. **Furnace.** Harvey Clayton Rentschler and John Wesley Marden, East Orange, N. J., assignors to Westinghouse Lamp Company, a corporation of Pennsylvania.

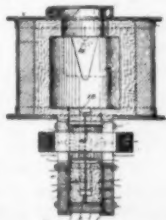
A device for heat-treating material, comprising an enclosing envelope having a plurality of openings, closures comprising electrodes fitted in the openings, a pool of electrically conductive liquid within said envelope and in which one of said electrodes is immersed, and means mounted on the other electrode for engaging the material to be heat-treated.

1,596,413. August 17, 1926. **Paint and Varnish Remover Containing Furfural.** Carleton Ellis, Montclair, N. J., assignor to Chadeloid Chemical Company, New York, N. Y.

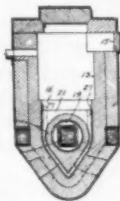
A paint and varnish remover comprising furfural, monochlorobenzol and a wax.

1,596,582. August 17, 1926. **Electric Melting Furnace.** James Robert Coe, Waterbury, Conn., assignor to The American Brass Company, Waterbury, Conn.

A furnace of the class described having, in combination, a container for molten metal, a two-part channel box secured to the container, a lining for said box comprising a plurality of sections of refractory material having in their adjacent inner faces registering surfaces forming a channel whose ends open into said container, said sections lying between the two parts of said channel box, means for holding said two parts together so as to clamp the said sections between them, and yielding material between the outer faces of said sections and the two parts of said box.



1,596,736. August 17, 1926. **Manufacture of Linings for Electric Furnaces.** Richard C. Jeter, Waterbury, Conn., assignor to Scovill Manufacturing Company, Waterbury, Conn.



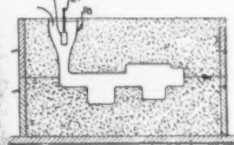
A templet for the purpose described having its body, throughout at least the greater part of its extent, formed in two separate and disconnected parts normally separated by a substantial space, said parts in normal position providing a form having substantially the shape of the channel to be formed, and a removable reinforcement for temporarily holding said parts in such normal spaced relation, the parts being movable under pressure one toward another upon removal of said reinforcement.

1,596,761. August 17, 1926. **Die-Casting Metal.** Willis M. Peirce and Edmund A. Anderson, Palmerton, Pa., assignors to The New Jersey Zinc Company, New York, N. Y.

A zinc base alloy containing not less than 85 per cent zinc and 0.01 to 0.3 per cent magnesium.

1,596,888. August 24, 1926. **Process and Composition of Matter for Increasing the Fluidity of Molten Metal.** Aladar Pacz, East Cleveland, Ohio.

A composition of matter for the purpose described containing powdered aluminum, an oxygen compound of boron, and the oxide of a metal which is reduced by aluminum and which also alloys with boron.



1,596,990. August 24, 1926. **Paint and Varnish Cleaner.** Adolph Nehring, Chicago, Ill., assignor to A. Nehring & Sons Company, Chicago, Ill.

A composition of the character described comprising substantially three-fourths starchy substance, one-sixth soda ash and one-twelfth gritty material.

1,597,059. August 24, 1926. **Process of Making Bearing Material.** Alfred A. Crimp, Chicago, Ill.

The process of impregnating bearing metal with graphite which consists of providing molten bearing metal and applying thereto graphite and saltpeter.

1,597,862. August 31, 1926. **Electroplating Apparatus.** Constantine G. Miller, Chicago, Ill., assignor to The Meaker Company, a corporation of Illinois.

An electroplating apparatus comprising a plurality of tanks, a hanger for supporting articles to be plated, a bus-bar parallel to the tanks, shoes adapted to slide along the bus-bar and also support one end of said hanger, a conveyor for moving said shoes along said bus-bar and a second conveyor adapted to lift the hanger off its supporting shoe and out of the adjacent tank and drop it onto one of said shoes and into the next tank.



1,598,236. August 31, 1926. **Method of Building and Starting Electric Induction Furnaces.** Charles A. Brayton, Jr., Cleveland, Ohio, assignor to the Induction Furnace Company, Cleveland, Ohio.

The method of forming the refractory lining of an electric induction furnace and starting the same, which consists in providing a casing for a short circuited metallic core for forming the channel, in which casing there is sufficient cross-sectional air space to permit lateral displacement of the core when expanding, packing a refractory lining about the core, inducing a low current in the core to heat it and dry out the lining about the core and increasing the current to reduce the core to a molten mass.



According to an announcement, under date of September 28, 1926 letters patent No. 1,601,456 was granted to W. J. Smart on an exhaust wheel or fan, same having roller or ball bearings and special lubricating arrangement, that was assigned to Eureka Pneumatic Spray Company, Richmond Hill, N. Y., who reserved all rights.

EQUIPMENT

NEW AND USEFUL DEVICES, MACHINERY AND SUPPLIES OF INTEREST

METAL PARTS WASHING MACHINE

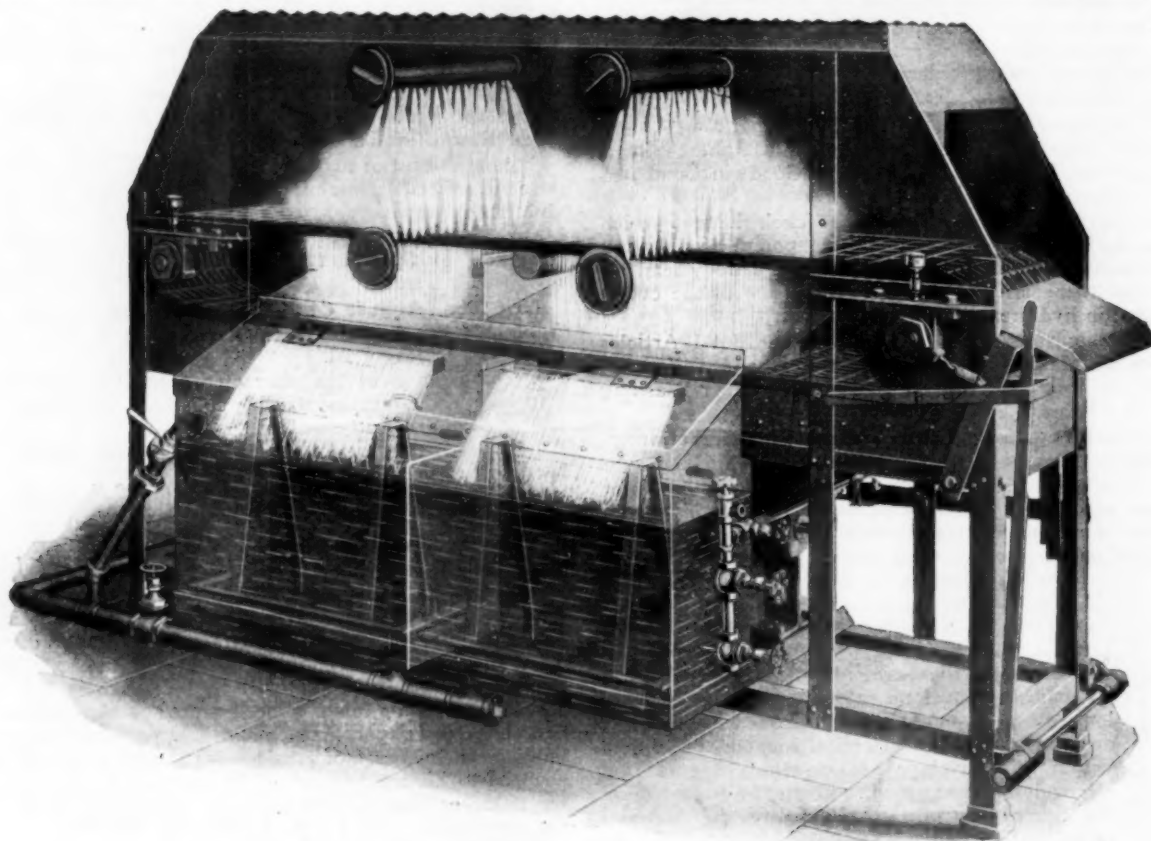
The Colt Autosan Metal Parts Washing Machine was developed after years of experiment in the plant of the Colt Patent Fire Arms Manufacturing Company, Hartford, Conn., for washing parts in process. They have extended the idea and are now prepared to furnish machines for a large variety of purposes. A number of them have been installed in various plants.

The operation of the Colt Autosan is continuous—the work is placed on the moving conveyor, passing through a series of fixed sprays operating from above and below, and emerging from the machine thoroughly washed, and in the larger machines, rinsed.

For certain washing operations side sprays are an advantage. These can be furnished when specified.

Features claimed for the Colt Autosan metal parts washing machine are:

1. The type of conveyor used which permits all but very small parts being washed without racking or placing in trays.
2. The tanks which are on the side of the machine and, therefore, very accessible.
3. Construction of pump—centrifugal type with out-board ball bearings.
4. The safety device which prevents parts accidentally caught in the conveyor from carrying around the drum.
5. Accessibility to all parts of the machine at all times.
6. The balanced sprays which deliver approximately 130 gal-



COLT AUTOSAN METAL PARTS WASHING MACHINE

The conveyor is controlled by a lever which enables it to be started or stopped at will by the operator. This has no effect on the sprays, which act independently and continue to function as long as the motor is in operation.

lons per minute per set with a pressure of 5 to 7 lbs. and at the same time do not throw the parts around on conveyor.

7. The selection of materials that go to make up the machine and the excellent workmanship.

NEW ACETYLENE GENERATOR

Every manufacturer unquestionably uses one or more oxy-acetylene outfits. The acetylene to operate an oxy-acetylene outfit is ordinarily purchased in cylinders of about three hundred foot capacity. With the Rego acetylene generator it is claimed that clean cool acetylene can be manufactured for approximately 1¼ cents per cubic foot.

The Rego generator is a new type of portable generator which has just been approved by the underwriters and is incidentally the first and only medium pressure acetylene generator ever approved by them for portable use.

Of particular interest are some of the stringent tests which this generator passed before being approved. Its stability was shown

by two tests—the first in which one wheel of the generator was raised up twenty-one inches without the fully charged generator tipping over sideways. In the other the front of the truck was raised sixty-six inches without the generator tipping over backwards. Then, just to be sure that nothing dangerous could happen, the generator was set to producing gas at ten pounds pressure and thrown on its side. All of the gas and water was expelled through the blow-off valves without any damage.

In the next test the generator carbide feed was locked and once more the generator thrown on its side. The pressure did not build up inside the generator and upon being returned to an upright position the entire charge of carbide was run through and the machine operated perfectly.

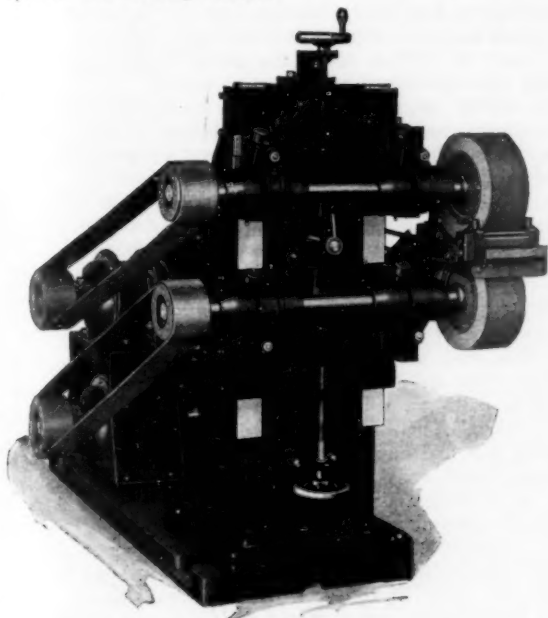
This generator is made by the Bastian-Blessing Company, Chicago, Ill.

AUTOMATIC POLISHING MACHINES

STRIP POLISHING MACHINE

The Mitchell strip polishing machine automatically polishes both sides of metal strips up to 6" in width and any length, simultaneously.

The machine is provided with two wheel spindles, one above the other, with means for adjusting vertically to accommodate various thicknesses of material and also to compensate for the wear of wheels. Each spindle is driven by a separate motor. The lower motor, in addition to driving the lower wheel spindle, also operates the feeding rollers.



MITCHELL STRIP POLISHING MACHINE

The upper motor drives the upper wheel spindle and also operates an oscillating mechanism for moving the upper and lower wheel spindles back and forth. This imparts a wavy surface to the parts being polished and further keeps the wheel faces true and parallel.

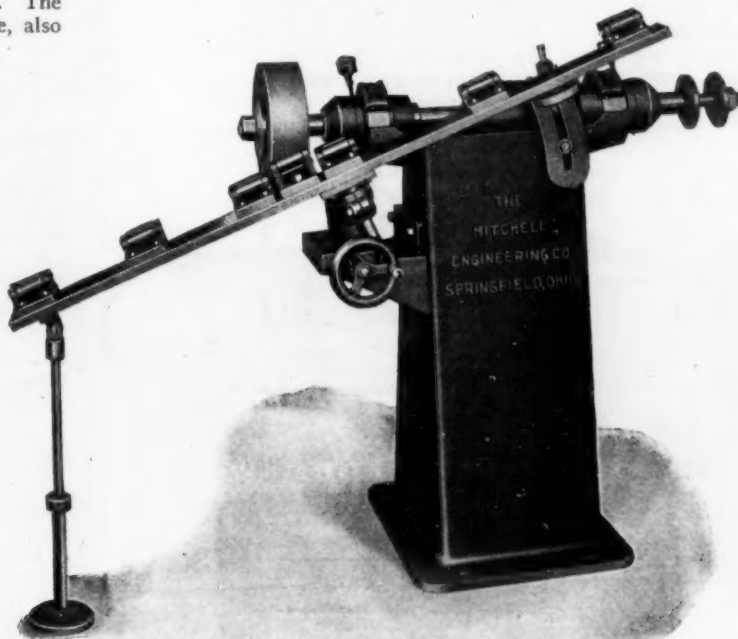
In operation it is only necessary to start the strips into the feed rollers, which carry them between the wheels and discharge at the rear without further handling.

One of these machines in the plant of the Delco Light Company, Dayton, Ohio, is doing the same amount of work formerly done by six polishers.

TUBE POLISHING MACHINE

The Mitchell Tube Polishing Attachment shown in the accompanying cut is attached to a standard No. 6 Mitchell polishing lathe. It can be attached to any of the Mitchell machines.

In operation the tubes are laid on the rollers on the upper or elevated end, and brought into engagement with the face of the polishing wheel. The polishing wheel itself, without any other



MITCHELL TUBE POLISHING MACHINE

means, rotates the tubing, polishing it at the same time and feeds it past the face of the wheel.

It is further possible to pass the tubing at varying speeds by changing the angle of the tube support, means being provided for such adjustment. It is also possible to provide for either light or heavy polishing by means of a cross slide and hand wheel.

This machine can be adapted to polishing practically any size of tubing by merely changing the rollers, directly in front of the wheel.

Both of the above machines are distributed by Frederic B. Stevens, Inc., Detroit, Mich.

NEW SUCTION TORCH

The Hauck Manufacturing Company, Brooklyn, N. Y., has recently placed on the market a new torch, the Hauck Venturi Suction Torch. Its distinctive feature is that the fuel is under suction, or in the words of the fire underwriters:

"No pressure is maintained on the oil supply tank, thereby eliminating the danger of injury to life, and fire resulting from a bursting tank. The danger of the oil spreading about by the breaking of the oil supply line is also eliminated."

The torches are approved by both the Underwriters Laboratory of Chicago and the Factory Mutual Fire Insurance Company's Laboratory.

Should the oil line be cut, oil flow stops instantly because suction is broken. Should the air line be cut, oil flow stops instantly because suction ceases at burner.

Other safety features claimed are as follows:

Double wire gauze screen in filler connection prevents ignition of oil or gases in tank.

Ball check in filler cap seals tank when tank is tilted or upset.

Oil line and air line of specified high grade rubber.

Tank is seamless drawn steel, with all connections welded or brazed.



SMALLEST SIZE (PORTABLE) HAUCK VENTURI SUCTION TORCH EQUIPMENT

TANK RHEOSTATS

The Type "H" tank rheostat, made by the Connecticut Dynamo and Motor Company, Irvington, N. J., is designed to meet every requirement of the plating room. It is claimed that this rheostat will regulate the voltage at the tank from zero to the full voltage of the dynamo in steps of one-hundredth of a volt if necessary, and do this accurately and effectively whether the tank is full of work or only one small piece is in the tank.

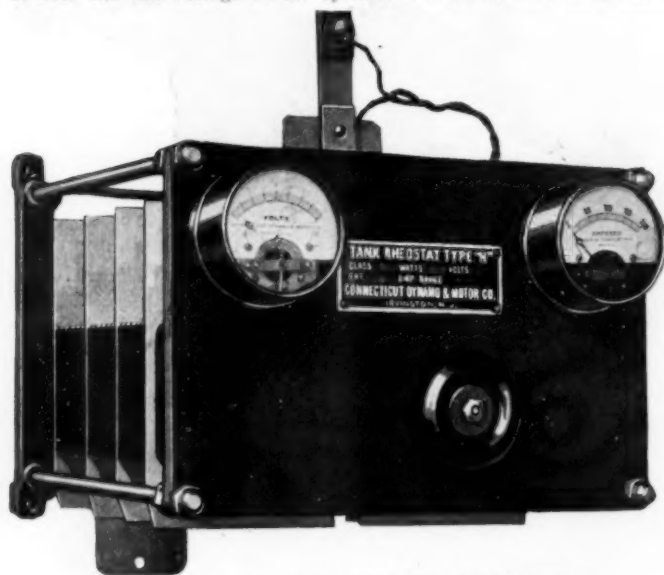
With the Type "H" tank rheostat a small quantity of work can be plated in a large tank without resorting to the expediency of hanging anodes on the cathode rod (a very inefficient and unreliable method). The voltage may be raised to and regulated at near the full voltage of the dynamo without the use of a short

circuiting switch. A short circuiting switch does not permit any regulation when used.

Each rheostat is regularly equipped with a voltmeter mounted on its face. This permits the operator to observe at all times the exact voltage on the tank, assisting him to obtain uniform, consistent results.

ADVANTAGES CLAIMED

1. They are indestructible, there being no coils or resistance wires to burn out.
2. There are no sliding contacts to corrode.
3. No springs to lose their temper.
4. No switch blades or clips to corrode or become soft.
5. They have no definite steps, the increase and decrease in voltage being continuous and even.
6. They regulate the voltage from zero to the full voltage of the dynamo, independent of the amount of plating surface exposed.
7. They accomplish a great saving in power by permitting the operation of the dynamo at a lower voltage.
8. Each tank rheostat is regularly equipped with a voltmeter mounted on its face.



CONNECTICUT TYPE H TANK RHEOSTAT

ALUMINUM ALLOY NAILS

The American Steel Company, Pittsburgh, Pa., is manufacturing a line of nails such as tie dating and roofing nails made of "Alual" metal. The word "Alual" is derived from aluminum and alloy and these nails are what the name would indicate, viz., an alloy of aluminum. This nail is intended for shingle roofs, slate roofs, railroad ties and any place that a nail is exposed to rust from the atmosphere and the weather.

In order to overcome the rusting properties of a steel nail, they are usually galvanized, but most people do not have at hand the means of checking up the galvanizing. Frequently copper nails are used instead of galvanized nails and this "Alual" nail is made to take the place of copper nails. It is said to run about ten per cent less in price than a copper nail, i. e., nail for nail.

EQUIPMENT AND SUPPLY CATALOGS

Brinell Testing Machines. Herman A. Holz, New York.
Oakite Products. Oakite Products, Inc., New York.
"Odds and Ends." Hardinge Company, York, Pa.
Guaranteed Electric Motors. Fuerst-Friedman Company, Cleveland, Ohio.
Protectomotor. Filter. Staynew Filter Corporation, Rochester, N. Y.
Automatic Blockers. The Blake and Johnson Company, Waterbury, Conn.
Safety in Foundries. Pamphlet No. 73. National Safety Council, Chicago, Ill.
Portable Crane-Type CU Tractor. Elwell-Parker Electric Company, Cleveland, Ohio.
High Speed 2-Housing Mills. The Blake and Johnson Company, Waterbury, Conn.
Increased Warehouse Facilities. U. T. Hungerford Brass and Copper Company, New York.
Slitting Machines. Light High-Speed Type. The Blake and Johnson Company, Waterbury.
Flattening Machines. 4-Housing Type. The Blake and Johnson Company, Waterbury, Conn.
"18 Vital Questions to Ask When Selecting a Die Head." Eastern Machine Screw Corporation, New Haven, Conn.
"How to Babbitt a Bearing." United American Metals Corporation, Syracuse Smelting Works, Subsidiary, Syracuse, N. Y.
O-B Porcelain Insulators, Trolley and Line Materials, etc. Catalog No. 20-0 B. The Ohio Brass Company, Mansfield, Ohio.
"The Operator's Stabilizer." A House Organ published by A. F. Davis, vice-president, Lincoln Electric Company, Cleveland, Ohio.
Business Organization. The Functions of the Treasurer. Policyholders' Service Bureau, Metropolitan Life Insurance Company.
Industrial Thrift and Savings Plans. Report No. 52. Pol-

icyholders' Service Bureau, Metropolitan Life Insurance Company, New York.

Apprenticeship. Information and Experiences in the Development of Industrial Training. Department of Manufacture, Chamber of Commerce, Washington, D. C.

MF Motor Starting Oil Circuit-Breakers. Leaflet 20292. Westinghouse Electric and Manufacturing Company, East Pittsburgh, Pa.

General Electric Publications. Automatic Arc Welding Apparatus—Large Tank and Pipe Machines; Small Tank Machines; "Industry Comes to Electricity for Its Heat"; Centrifugal Air Compressor.

Electric Controlling Apparatus. Allen-Bradley Company, Milwaukee, Wis. Direct Current Contactor; Alternating Current Resistance Starters; Semi-Automatic Slip Ring Motor Starter; Type J-1552 Form T Across-the-Line Starting Switch; Type J-3052 Automatic Resistance Starter.

Core and Mold Ovens. The Foundry Equipment Company, Cleveland, Ohio. A large and complete booklet on this topic. It contains a discussion on fuels and also the various types of ovens which are peculiarly adapted for various classes of work. Dry sand molding practice is covered.

Westinghouse Revised Leaflets. L 3549-B, L 20135-A, and L 20011-A, covering Type CA carbon circuit breakers; Types CL and CN carbon circuit-breakers, and Types F-11 and F-22 oil circuit breakers. Westinghouse Electric and Manufacturing Company, E. Pittsburgh, Pa.

"The Story of Boronics." American Boron Products Company, Inc., Buffalo, N. Y. This booklet contains complete information on "Boronic Alloys," and also includes an unusually good appendix on melting practice; the manufacture of bronze; methods of analysis for non-ferrous alloys; weights and measures; various information on solids and liquids, metals and alloys, melting points, metric conversion table, decimal equivalents, etc.

ASSOCIATIONS and SOCIETIES

REPORTS OF THE CURRENT PROCEEDINGS OF THE VARIOUS ORGANIZATIONS

ELECTROCHEMICAL SOCIETY

HEADQUARTERS, COLUMBIA UNIVERSITY, NEW YORK

The Fiftieth National Convention of the American Electrochemical Society was scheduled for October 7, 8 and 9, 1926, with headquarters at Hotel Washington, Washington, D. C.

The Thursday morning session was devoted to a Symposium on "Materials for Extreme Conditions in the Electrochemical Industries," and topics such as linings for high temperature furnaces, alloys to resist corrosive liquids and high temperatures were discussed. Dr. H. W. Gillett was Chairman of the Symposium.

The Friday morning session was presided over by Dr. Wm. Blum, of the Bureau of Standards, president of the society. The first paper was by an associate of Dr. Blum's, M. R. Thompson, who has made a careful investigation of the acid zinc plating baths. He contends that it is not possible to increase materially the throwing power of these plating baths, chiefly because of the low cathode polarization which they possess. He finds, however, that very simple zinc plating baths of much higher conductivity than those commonly used may be prepared and satisfactory deposits produced at unusually high current densities. These new baths contain a high concentration of sodium or ammonium chloride, together with a small concentration of aluminum chloride.

Prof. E. A. Vuilleumier, of Dickinson College, has been able to produce relatively fine-grained deposits from so-called "unsatisfactory" electrolytes, by coating the cathode with a film of glycerine, sugar solution, or even water. The reason for this is probably the formation of many nuclei in the early stages of deposition.

An important contribution was that of Giichiro Fuseya and Kwanji Murata, entitled "The Common Properties of Addition Agents in Electrodeposition." These investigators have carried out an extensive research on addition agents and will report upon a number of new findings. The use of addition agents is, unfortunately, still largely guided by thumb rule and the present contribution from Japan furnishes much enlightenment towards the possible solution of the problem.

Dr. Colin G. Fink and C. A. Philippi reported upon the voltage studies made in copper refining solutions. They pointed out that methods of measurement in the past have not always been reliable and that the voltage of a cell had best be recorded not as "over-all" voltage, but as voltage composed of the three components, cathode, solution, and anode voltage. At the University of Wisconsin, Prof. Kahlenberg and his student, Dr. H. D. Royce, investigated the electrode potential and replacing power of manganese. Manganese is comparatively a newcomer in the electrodeposition field. In the past, very little has been known of this metal when electrodeposited. Clayton M. Hoff, of the Grasselli Chemical Company, presented a paper on the Grasselli Process of cadmium plating and rustproofing steels. G. Prescott Fuller, of the Niagara Electrolytic Iron Company, described the method of producing seamless iron tubes and pipes by electroplating iron on a greased steel mandrel. The final paper of the session was that of Leon McCulloch, on The Passivity and Corrosion of Iron.

Following the technical session on Friday, members and guests gathered at luncheon to discuss the very important topic of "Preparation for Electrodeposition." Prof. E. M. Baker, of the University of Michigan, well known to electroplaters on account of his splendid work in nickel plating, presided at the Round Table and open the discussion. Members interested in electroplating had an opportunity to inspect the cells in operation at the laboratories of the Bureau of Standards. The society visited the government laboratories in a body on Friday afternoon.

Among the social features of the program was a boat trip to Mount Vernon. On Thursday evening there was an informal dinner, at which Prof. W. D. Bancroft, of Cornell University, discoursed on "The Ramifications of a Research Problem." The dinner was followed by an informal dance. The formal address of the convention was delivered by Dr. Charles Greeley Abbot, Director of the Smithsonian Observatory, at the

National Academy of Sciences on Friday evening, October 8. The title of Dr. Abbot's address was "Solar Radiation," a subject of increasing importance to engineering. At this same meeting, Honorary Membership in the American Electrochemical Society was officially bestowed on Dr. Edward Weston, internationally known for his standard cell. It was Dr. Weston who, in 1875, established in Newark, N. J., the first factory in America devoted exclusively to dynamo electric machines. He is also the inventor of the Weston measuring instruments.

NEW YORK BRANCH, A. E. S.

HEADQUARTERS, CARE OF J. E. STERLING, 2595-45TH ST., ASTORIA, L. I.

The September meetings of the New York Branch of the American Electro-Platers' Society, held at the World Building, Park Row, were most interesting and instructive. The subjects taken up and discussed at the first meeting were cleaning and preparing aluminum for nickel plating; nickel baths for plating aluminum; tripoli and lime compositions for cutting down the same; Buffs and speed lathes were next taken up, and a lively discussion was held on these subjects.

At the second meeting which was a good and welfare meeting, cadmium plating was taken up and it was predicted that in a few years more concerns would cadmium plate their work instead of zinc, on account of its rust resisting qualities. Nickel plating die castings was discussed.

The Branch decided to hold an invitation meeting on December 9, 1926, the same to be addressed by prominent men in the field. Invitations will be sent out to men who are eligible to membership in the Society.

Arthur Grinham is chairman of the Committee assisted by Mr. Schorr and Mr. Dubpernell.

TESTING MATERIALS SOCIETY

HEADQUARTERS, 1315 SPRUCE STREET, PHILADELPHIA, PA.

GALVANIZING STANDARDS TO BE DEVELOPED TO IMPROVE QUALITY OF ZINC COATINGS

The organization of a committee to carry on the important work of standardizing the quality of zinc coatings for iron and steel products has just been completed by the American Society for Testing Materials under the auspices of the American Engineering Standards Committee. The following six technical sub-committees are ready to begin their work.

I. Hardware and Fastenings, R. F. Hosford, chairman, American Telephone and Telegraph Company.

II. Sheets and Sheet Products, J. T. Hay, chairman, United Alloy Steel Corp.

III. Plates, Bars, Structural Shapes and Their Products, V. F. Hammel, chairman, Electric Bond and Share Co.

IV. Pipes, Conduits and Their Fittings, F. N. Speller, chairman, National Tube Co.

V. Wire and Wire Products, J. C. Johnson, chairman, Pennsylvania Railroad System.

VI. Methods of Testing, C. D. Hocker, chairman, Bell Telephone Laboratories.

Several of these sub-committees have been further sub-divided in order to facilitate the difficult and detailed work involved in developing the specifications in which the ultimate results of the committees' work will be presented. Another committee, No. VI, on Marine Hardware and Ship Fittings has not yet been organized and will be taken up for consideration later as the work develops.

The scope of the committees' work includes a very wide range of products and methods of general industrial importance. As examples may be mentioned electrical fittings, including conduits, "galvanized" sheets and plates, water pipes, valves and fittings, agricultural tools and hardware, rivets, screws, nails, fencing material and woven wire cloth. All types of zinc coating, including the spray process, hot-dip and electro-galvanizing, sherardizing, electroplating, etc., will come under the work of this committee.

BRASS MANUFACTURERS ASSOCIATION

HEADQUARTERS, CITY HALL SQUARE BUILDING, CHICAGO, ILL.

The National Association of Brass Manufacturers' held its third quarterly meeting at the Hollenden Hotel, Cleveland, Ohio, on September 15th-17th.

On the first day the final touches of the official catalog that is to come out on January 1, 1927, was whipped into shape, many new features and fixtures being added to this edition. In addition, the lists will appear in "piece" in lieu of the "dozen" form, as formerly and at a greatly reduced figure from that of previous lists, so that the new catalog lists are based in a way that will do away with the very high or fictitious discounts and while manufacturers will of course apply any discount they may see fit, it will be in lower brackets which would be more readily understood and much better for the jobber, the contractor, the plumber and the buying public.

Among the more important things handled in the various sessions was the establishing of uniform roughing in measures for Shower, Bathroom and Lavatory Fixtures.

Charles Muend, of the Haines, Jones & Cadbury Company of Philadelphia, was appointed as a special representative of this Association to attend the meeting of the Bureau of Standards, Division of Simplified Practice of the Department of Commerce, Washington, D. C., which will be held on September 22nd where matters pertaining to standards of vitreous china plumbing fixtures and other plumbing goods will be considered.

The business conditions generally were discussed and some very authentic and interesting tables were furnished, indicating that the 1926 building volume far exceeded that of the past two years and everything points to a good business in the future and the delegates were quite optimistic on this point and while it seems that with a fair volume of business assured, speculative buying or over-buying with a view of securing profits from advance of purchases has become a thing of the past. Nor is it wise to work on the "hand to mouth" basis but the feeling prevailed that everybody realizes their interests are better served by buying reasonably for immediate wants or demands that are in sight, rather than over-purchasing, which at times leads to financial stress and involvement.

After a three day's session, the meeting adjourned to meet in New York City on December 16th and 17.

WASTE MATERIAL DEALERS

HEADQUARTERS, TIMES BUILDING, TIMES SQUARE, NEW YORK

A regular meeting of the Association was held at the Hotel Astor, New York, on Wednesday, September 29, at 2 P. M. The meeting was preceded by an informal members' luncheon at 1 P. M. and was followed by a meeting of the Foreign Trade Division at 3 P. M. There was also held a meeting of the Board of Directors which was scheduled for 11:30 A. M. the same day.

The waste material industry for many months past has not been in a very satisfactory condition, but at present there are signs that the worst is over and in some branches of the industry there has been substantial improvement in the demand.

AMERICAN WELDING SOCIETY

HEADQUARTERS, 29 W. 39TH STREET, NEW YORK

Exhibitions and Demonstrations.—One of the largest Welding Expositions will be held in connection with the Fall meeting at the Broadway Auditorium, Buffalo, N. Y., November 17-19, 1926, showing new developments in welding apparatus and supplies. A unique feature of this exposition will be an exhibit of a large variety of welded products. The exhibit will open the day preceding the annual Fall meeting of the society.

Technical Sessions.—Technical sessions include authoritative papers and discussions on "The Design and Development of Welding Apparatus"; "Organization of Welding on the Railroads"; "Welding of Locomotive Parts"; "Welding Science in the Engineering Curriculum of Universities"; and "Arc Welding in a Gaseous Atmosphere."

Inspection Trip.—On Friday afternoon, November 19, 1926, an inspection trip has been arranged to Niagara Falls. Members of the society and their guests will view the Falls from the American side with a short inspection trip through the Niagara Falls power

House. This will be followed by a buffet supper on the Canadian side and then a special illumination of the Falls will be shown, returning to Buffalo late in the evening.

American Bureau of Welding.—A meeting of the American Bureau of Welding and of the Welding Wire Specifications Subcommittee will be held Thursday afternoon. The remarkable progress made by the research department of the American Welding Society (American Bureau of Welding) will be a source of satisfaction to the members of the society and the welding fraternity.

DECORATIVE LIGHTING EQUIPMENT

HEADQUARTERS, 424 GUARANTEE TITLE BLDG., CLEVELAND, O.

The Artistic Lighting Equipment Association, formerly the National Council of Lighting Fixture Manufacturers, are completing plans for the largest and most elaborate display of lighting equipment ever undertaken by the industry; embracing fixtures, wall brackets, floor, bridge and table lamps, metal furniture, industrial and commercial lighting units, illuminating glassware, shades, lighting equipment—accessories, parts and supplies of all kinds.

These displays and demonstrations will be a part of the National Exhibition to be held at the Hollenden Hotel, Cleveland, Ohio, Jan. 31 to Feb. 5, 1927, inclusive.

It is planned by the National Association of Lighting Equipment Dealers to hold their meeting and convention at the same time and place.

MACHINE TOOL EXHIBIT

HEADQUARTERS, YALE UNIVERSITY, NEW HAVEN, CONN.

The New Haven Machine Tool Exhibit was held in the Mason Laboratory of the Sheffield Scientific School of Yale University.

On account of the scarcity of labor both skilled and unskilled and the increasing demand for vast quantities of accurately made parts for automobiles, household devices, radios, etc., automatic machine tools are now of the highest importance in production plants. These machines are extremely interesting to watch in operation and were seen at their best at the New Haven Exhibit. Grinders, punch presses, milling and drilling machines, and lathes were running there under automatic control and produced complicated pieces (which in many cases were identified as familiar parts of well known products) at almost incredible speed and with extreme accuracy.

Parallel with the exhibition of this ultra-modern machinery there were technical sessions, primarily for engineers and manufacturers, but in some cases interesting to the layman. At these technical sessions authorities of national repute spoke upon live topics covering the design and use of machine tools, plant management, apprenticeship systems, etc. Among these authorities was Brig. Gen. C. L'H. Ruggles, Ord. Dept., U. S. A., who is Assistant Chief of Ordnance; Dexter S. Kimball, Dean of the College of Engineering, Cornell University, who has made a deep study of the history of manufacturing and who won a national prize when he coined the slogan the "Master Tools of Industry" to describe machine tools; and Harold S. Falk, whose work in connection with the carrying out of the interesting and successful District Apprenticeship System at Milwaukee has received wide notice.

NATIONAL SAFETY COUNCIL

HEADQUARTERS, 108 E. OHIO STREET, CHICAGO, ILL.

Factors in the metal industry should be interested in a new pamphlet entitled "Safety in Foundries," which will be sent to readers of this publication who address the National Safety Council at 108 East Ohio street, Chicago. The latest safe practice pamphlet is too lengthy for reproduction in full in THE METAL INDUSTRY but contains much valuable information and is elaborately illustrated with pictures showing how to prevent accidents.

Practically all arrangements have been completed for the Metals Section program which will be presented at the fifteenth annual safety congress in Detroit from Oct. 25 to 29, inclusive. Chairman A. C. Gibson has arranged a fine program.

Chairman Hensel, of the membership committee, calls attention

to the fact that comparatively few people in the metals industry are members of the National Safety Council which is a non-profit making, non-partisan, co-operative institution serving as a clearing house of information for this industry along accident prevention lines. Most of the metal concerns that are now participating in the safety movement are large concerns but Chairman Hensel feels that small companies can get a great deal of good out of affiliations with the association, because one serious accident, a costly fire, the death of a valuable workman, etc., could put a serious hole in the profits of a small company.

Everyone in the metal industries is invited to attend the coming convention.

AMERICAN GAS ASSOCIATION

HEADQUARTERS, 342 MADISON AVENUE, NEW YORK

The American Gas Association held its eighth annual convention at the Million Dollar Pier, Atlantic City, N. J., October 11-15, 1926.

Personals

W. L. ABATE FORTY-EIGHT YEARS IN THE BRASS INDUSTRY

Walter L. Abate, the brass finishing editor of THE METAL INDUSTRY, has just rounded out forty-eight years of brass finishing. Mr. Abate was born on November 1, 1867, in Detroit, Mich., where he attended the public schools. Upon leaving school he served a four years' apprenticeship with the firm of James Flower and Brothers. This company did a jobbing machine and brass business, manufacturing all kinds of brass goods such as valves and hydrants, plumbing material, steam cocks and valves up to 42-inch diameter besides general steam engine repairs.



W. L. ABATE

The apprentice boys were put through a course of training which enabled them to work in any part of the shop. They were allowed to choose the branch of work that appealed to them to learn as a trade, but were required to work in any other department when called upon. Choosing the brass industry for a trade, Mr. Abate was placed in the brass department in charge of David B. Buick, foreman, who later became the inventor and promoter of the car of that name.

During this period Henry Ford, the famous automobile manufacturer, was an apprentice in the machine shop and as the two boys lived in the same part of the city, they walked back and forth daily to work. Apprentice boys received at the beginning \$1.50 per week with a 50-cent advance yearly on New Year's Day, when they were given a new silver dollar by the owner, Mr. Flower. That explains the reason for the daily 7-mile walk to work.

Leaving Flower Brothers at the age of 17, Mr. Abate worked in several shops for experience until at the age of 21 he became a foreman of a small gang of men and later became foreman of the brass department of the Detroit Ship Building Company. Lubricators and injectors were becoming important at this time and more than ten years were put into this branch of the business at the plants of the Penberthy, American Injector and Detroit Lubricator Companies. He was superintendent of the brass department of the Michigan Brass and Iron Company for three years.

During four years as superintendent of the McRae and Roberts Company, Mr. Abate developed a new chucking lathe using an air chuck. Later for seven years he was general superintendent and manager of the Nathan Manufacturing Company of New York. Leaving that firm he became General Superintendent of the brass shops of the Standard Sanitary Manufacturing Company of Pittsburgh, Pa., for one year.

Taking up engineering work, Mr. Abate spent a year with the Haydenville Brass Works, Haydenville, Mass., later acting as assistant secretary. During the early part of the war, he was production manager of the American Pin Company, Waterbury, Conn. Later he returned to Detroit and entered the service of the Ordnance Department where he was put in charge of the

production of fuses at the plant of the Hancock Manufacturing Company, Charlotte, Mich. Later he was sent to the Cadillac Motor Car plant on Liberty bearings where he remained until the close of the war.

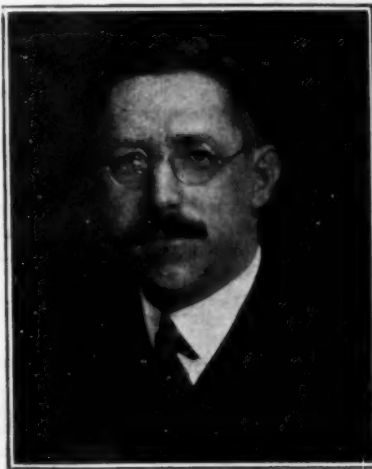
Two and a half years after the war, he was with the Holley Carburetor Company in the engineering department. A good deal of this time was spent in the development of the permanent mold and its patterns, and he installed the initial iron foundry equipment for this work.

Mr. Abate, during his career, has been interested in a number of new appliances and devices for the development of the brass finishing business, at one time even being interested in a new furnace known as the M. R. V. For several years Mr. Abate has been in the brass business for himself, operating under the name of W. L. Abate, at 2085 Clark Ave., Detroit, Mich.

Mr. Abate looks after the brass finishing problems of THE METAL INDUSTRY while his contemporary, W. J. Reardon, also of Detroit (who has had forty years' experience in the brass foundry, and a personal of whom was published on page 389 of our September number), takes care of the foundry problems of our readers. Both men have given the best of their lives to the brass industry; one in making the castings and the other in finishing them.

N. K. B. PATCH

Nathaniel K. B. Patch elected to serve as a director of the American Foundrymen's Association for the three year term beginning in the fall of 1926 has been connected with the brass



N. K. B. PATCH

foundry industry ever since he was graduated from the Massachusetts Institute of Technology. His preparatory education was secured at the public school and high school of the city of Buffalo.

Mr. Patch entered the employment of the Lumen Bearing Company at the time this organization was first started and has remained with this company ever since. He spent four years as salesman then in 1904 was made manager of the Canadian plant. Later he was promoted to the position of general superintendent of the Buffalo plant which position he filled until

made works manager. In 1923 he retired as works manager because of impaired eyesight to assume the duties of secretary and advertising manager. Mr. Patch has been very prominent in technical organizations connected with the brass founding industry, being one of the original organizers of the American Brass Founders' Association and was elected one of the first directors of this association and was president in 1911. Besides being actively associated with technical committees of the A. F. A. he was chairman of the Committee on Non-Ferrous Metals of the American Society for Testing Materials.

He is a member of American Chemical Society, American Electro-Chemical Society, Institute of Metals (British). The Institute of Metals Division of the A. I. M. E., the Buffalo Engineering Society and the Buffalo Chamber of Commerce.

E. M. Stephenson, a member of the sales force of The Zapon Company for the past twenty-two years, has retired from active work. "Steve," as he is known to the entire metal finish-

ing trade, is one of the best informed men in the lacquer business. Many of the popular finishes of today are the result of his ingenuity and skill. Mr. Stephenson is now residing at his home in Hartford, Conn.

J. R. Trott has been appointed sales manager of the Abbott Ball Company, Hartford, Conn. He was formerly of the publicity department of the William L. Gillett Clock Company, Winsted, Conn.

Obituaries

GEORGE K. ELLIOTT

George K. Elliott, past chairman of the Institute of Metal Division and chief metallurgist of the Lunkenheimer Company, Cincinnati, Ohio, died after an operation for appendicitis, September 22, 1926.

George K. Elliott was born at Sidney, Ohio, and has been a resident of that state all his life of which the greater part was spent in Cincinnati. He graduated from the University of Cincinnati and taught science for a short while before entering the industrial field. For many years he was chief metallurgist and head of the chemical department of the Lunkenheimer Co., where his activities were divided between the foundry metallurgy of steel cast iron, and the non-ferrous metals. He was responsible for the development



GEORGE K. ELLIOTT

of the duplex process for cast iron which involves the use in tandem of the cupola and the electric furnace. The metallurgy of cast iron in the electric furnace he has described for the American Foundrymen's Association in a number of papers. In 1921 he was invited to write for the American Foundrymen's Association its first exchange paper to be presented to the Institute of British Foundrymen. Mr. Elliott was past chairman of the Institute of Metals Division of the American Institute of Mining and Metallurgical Engineers, past vice-president of the American Electrochemical Society and past chairman of its electro-thermic division. Also, he was a member of several technical committees of the A. F. A. and of the American Society for Testing Materials, and of other technical societies. For a number of years he had served on the non-ferrous metals advisory committee of the Bureau of Standards, and he belonged to the Sigma Xi honorary scientific society.

An extended description of Mr. Elliott's career was published in *THE METAL INDUSTRY* for April, 1924.

BENJAMIN NOBLE

Benjamin Noble, brass manufacturer for 28 years and active in the real estate field, died on September 19 in his home, 1771 Burns Avenue, Detroit, Mich., at the age of 67, following an illness of a month.

Mr. Noble was president of the Capitol Brass Company which he organized in 1898, just 13 years after he came to Detroit from Canada. He also was vice-president of the Continental Real Estate & Trust Company, and a director of the Title & Trust Company.

He leaves his wife, a son, G. Hubert Noble and two daughters, Mrs. L. E. DeGroat and Mrs. L. R. Middleditch.

He was a member of the Palestine Lodge No. 357, F. & A. M., the Michigan Sovereign Consistory, the Moslem Temple, the Detroit Golf Club, the Detroit Athletic Club, the Detroit Yacht Club, Lockmoor Country Club and the Detroit Curling Club.

CHARLES BARBOUR

Charles Barbour, manager Pittsburgh works, Standard Underground Cable Company, died in his home in Pittsburgh, August 17. Mr. Barbour was born on December 3, 1855, in Manchester, England, and in 1882 he came to the United States and located in Tarentum, Pa., where he entered the plate glass business. Later he was employed by the Pennsylvania Railroad and left that connection to engage in the tool manufacturing business with his brother. In 1890 Mr. Barbour became connected with the Standard Underground Cable Company.

HENRY GREVE

Henry Greve, died August 31 at his home in St. Louis, Mo. He was president of the John Wahl Commission Company, St. Louis, dealer in prime Western zinc, brass, special zinc and pig lead. His connection since early life with one of the oldest non-ferrous metal houses in the country had made him one of the best known men in the West in the zinc market and among the galvanizers.

ABRAM WARREN WHEATON

Abram Warren Wheaton died on July 22, 1926, at his home in Newark, N. J. Mr. Wheaton was the founder of the A. W. Wheaton Brass Works, Newark. He was 74 years old and widely known as an inventor.

NEWS OF THE INDUSTRY

BUSINESS REPORTS OF THE METAL INDUSTRY CORRESPONDENTS

NEW ENGLAND STATES

WATERBURY, CONN.

OCTOBER 1, 1926.

Completion of a seven and one-half mile tunnel by the city to carry water from the Shepaug valley to the Naugatuck valley was celebrated last week by a formal inspection by the city officials accompanied by the heads of all the brass industries. The tunnel completion means that the local factories will never lack water and that their productive capacity or

future expansion will never be hampered in this respect.

Waterbury manufacturers will have one of the largest displays on exhibit at the **American Institute Exposition** which will be held in the 69th St. armory in New York City, Oct. 18. Invitations for displays have been extended to only seven other cities, four of which are in Connecticut. Exhibits will be made only by those cities to whom awards were given by the institute prior to 50 years ago. Waterbury leads all the eight cities with the greatest number of awards prior to

1876, its total being eight. Invitations will be extended to the descendants and present owners of the individuals and concerns who received awards in the past to receive the American Institute certificate of fellowship at the armory. Among the local concerns who will participate are: the American Brass Company, the Scoville Manufacturing Company, the Chase Companies, Inc., the Waterbury Button Company, the American Ring Company, the Novelty Manufacturing Company, Steele & Johnson and the Waterbury Farrel Foundry & Machine Company.

Gasoline tanks in the airplane used by Commander Richard Byrd in his recent arctic flight were made of brass furnished by the Chase Companies, Inc., of this city, that concern has announced. Temperatures of 60 degrees below zero, fogs and 1,000 miles of ice country were encountered. The tanks were of 110 gallons each. Chase brass tubing also went around the world in navy's round-the-world flight over a year ago.

John H. Goss, vice-president and general superintendent of the Scovill Manufacturing Company, delivered one of the principal addresses at the Seventh New England Regional Cost Conference of the National Association of Cost Accountants in Hartford, last Friday. His subject was "Practical Value of Educational Work in Advancing and Coordinating the Business Organization. Mr. Goss last month was selected by the nominating committee of the Manufacturers' Association of Connecticut as vice-president of that organization.

The Sprague Electrical Supply Company has purchased the property at 39 Spring street and 42 School street at a price in the neighborhood of \$40,000. The land will be used for an addition to its present plant, it is understood.

As the result of the recent merger of the Chromium Company of America with the Chemical Treatment Company, one of the smaller of the New York plants will be moved to Waterbury, it has been announced at the local plant of the company. The local plant was purchased by the Chemical Treatment Company a year ago and it has been very busy lately, working two and sometimes three shifts of eight hours each a day. Local real estate agents have been asked to find living quarters for the additional employees who will be brought here when the transfer takes place. The concern controls patents for plating with "Crodon," an alloy of chromium.

Twenty thousand pounds of brass sheet made by the Chase Companies, Inc., were used recently in the making of the first 500 sets of the Bible in the Braille system at Los Angeles, it has been announced by the local concern. These Bibles are to be used by the blind. It is the largest single job of book printing in the Braille system of touch reading ever turned out. Five thousand sets of five volumes to the set were printed in this single job. Considerable original research work was done by the Chase Companies' laboratories to ascertain the right kind of brass sheets for the job.

The annual outing of the rolling mill departments of the Chase Metal Works and the Chase Rolling Mills was held Sept. 25th at Lake Quassapaug. F. A. Jackle, works manager of the Chase Companies, was the guest of honor and toastmaster. He gave an address on "Cooperation." Allen A. Klatt was in charge of the dinner. The committee in charge of the outing included: John Grady, John Byrnes, Patrick Whiston and Walter Baker of the Metal Works, and Frank O'Neil and William Wooley of the Rolling Mills.

The annual banquet of the Bristol Company foremen was held Oct. 2. One of the features was the broadcasting of the program through WTIC that evening. William H. Bristol, president of the company, and Mayor F. P. Guilfoile were the principal speakers. George Petitjean was the toastmaster of the evening. W. J. Richards is president of the association. —W. R. B.

BRIDGEPORT, CONN.

OCTOBER 1, 1926.

A report just issued by the Manufacturers' Association indicates that the local factories are still holding to 78 per cent of normal in the number of employees. The total number employed in Bridgeport plants at present is about 13,700, an increase over figures shown in reports of the association during the summer months. Due to Labor Day being a holiday the average hours worked per employe during the week of Sept. 11 numbered 41.4 hours, but the average week for the

rest of the month has been 49.5 hours per employe which has been about the average for the last 10 weeks. Indications are that factory workers will be busy for some time.

An action against the city of Bridgeport involving \$31,000 has been instituted by the Jenkins Brothers Company. The company asks the court to determine whether or not it is obligated to pay any additional taxes to the city on the list of 1920, and whether or not the city is in equity entitled to further taxes on the list. The company purchased a plant on Main street from the Crane Company in 1920, paying \$1,425,000. This included not only the taxable physical assets but also intangible assets such as goodwill and the business organization. Through an error of an accountant employed by the company the property of the company was listed for taxation in the list of 1920 for \$1,441,662. The common council, later accepted a report of appraisers that the taxable assets of the company were but \$765,285, but the city authorities, since then, have held that the action of the common council was beyond its power.—W. R. B.

TORRINGTON, CONN.

OCTOBER 1, 1926.

Largely through the efforts of Torrington manufacturers, the New Haven railroad has constructed a cement pavement in the vicinity of the Torrington freight station and on the roadway leading to the station.

Henry G. Ellis, president of the Torrington Manufacturing Company, has been elected Republican state central committee-man for the 30th senatorial district succeeding Frank B. Munn of New Hartford. Mr. Ellis formerly was chairman of the Republican town committee.

Permits for construction work, estimated to cost \$1,025,917.16, were issued by the city engineer during the fiscal year just ended. This is an increase of \$522,367.16 over last year.

The plant of the American Brass Company in Torrington was one of the largest producers during 1925 of the materials used by the Western Electric Company in manufacturing telephone equipment and other supplies, according to a report issued by the Southern New England Telephone Company.

Torrington is the eighteenth town in Connecticut in density of population per square mile, according to statistics, compiled by the state highway department. This is figured on a basis of area of 37.4 square miles and a population of 22,055 as given in the 1920 census, which indicates that there are 589 persons to every square mile here.

Most of the Torrington factories are working a full time schedules. The employment situation is good—J. H. T.

NEW BRITAIN, CONN.

OCTOBER 1, 1926.

That business in New Britain's industries has been more than ordinarily good during the last quarter is no better evidenced than in the action of the directors of the American Hardware Corporation, which embraces four of the major concerns of this city, in declaring extra dividends of \$2 per share from the surplus and reserved funds of the corporation. The dividends are payable October 1.

Review of business conditions shows them to be excellent and expectations as to the immediate future are such that the directors saw no reason for further withholding a large part of the reserve funds.

Landers, Frary & Clark, manufacturers of all sorts of electrical appliances as well as aluminum ware, household utensils and cutlery, is operating full time in all of its plants and departments and orders, preliminary to the large holiday trade, are coming in.

Summer witnessed no decline in business and this fall, despite a rumored slump, there seems to be absolutely no reason to expect anything other than normally good business. Things seem safe for the winter, according to the various concerns heads.—H. R. I.

PROVIDENCE, R. I.

OCTOBER 1, 1926.

The beginning of the final quarter of the year finds a marked business improvement in practically every line of metal indus-

try. There has been a gradual but constant tendency toward a more material optimism ever since the opening of the present year, that augurs well for the immediate future. While there are no indications of any booms or rushes in any of the metal lines, there is every reason to hope for a condition closely approaching normalcy.

Jewelry lines, which have been admittedly dull for many months, have taken a spurt and now show the most encouraging activity that has been manifested since the pre-war period. Heretofore the jewelry trades have been "spotty," a few concerns being busy on some novelty or specialty feature. The present situation, on the contrary, seems to affect nearly everybody, the staples coming in for due recognition. The silversmithing concerns are also experiencing a marked improvement in conditions and, for the first time in several years may be said to be operating on a favorable basis.

Textile industries continue apathetic and this has its de-

terrent effect upon the small tools lines, but this in a measure is met by the increased demands from the jewelry and building lines. The building trades continue brisk and the projected work increases rather than decreases almost daily. New buildings involving upwards of \$20,000,000 are now under way in this city alone, or about to be commenced and this activity is reflected by all the co-ordinated lines.

The Marathon Company has recently installed a complete new system of polishing benches at its plant on Hazel street, Attleboro. The increased facilities were necessitated to meet the increased business demands.

William Brown Gladding of New York, a former resident of Providence, died at his summer home at Sorrento, Maine, on August 31, following an illness of only two weeks. He was in his 71st year. When Mr. Gladding was a resident of this city he was for a number of years a vice-president of the **United Wire & Supply Company**.—W. H. M.

MIDDLE ATLANTIC STATES

ROCHESTER, N. Y.

OCTOBER 1, 1926.

With the dawn of the Fall season a certain stimulation has reached many of the larger units in Rochester's industrial territory. According to information obtained at various labor headquarters it is thought that since the first of the month fully 1,000 additional skilled mechanics have resumed steady employment about the city.

It is quite true that business prospects have greatly improved in the past fortnight, and a number of plants, in addition to that of the **General Railway Signal Company**, are operating at full capacity. It is good to note the fact that better business is reported at the works of the **Bausch and Lomb Optical Company**, reorganization of a year ago having brought about a marked change in a forward direction in all branches of the plant.

Since early in Spring the erection of new buildings and the displacing of old structures with rebuilt blocks has been a source of great value to the non-ferrous metal industry in Rochester, and from present indications activity along those lines is expected to continue well into the winter. For this reason all of the brass foundries and electro-plating plants in Rochester have been operating at high speed ever since December of last year. Hardly a brass worker in Rochester has been unemployed in a year.

Purchasing agents report shipments of copper, brass, tin, and aluminum to Rochester during the past year greatly exceeded that of a year ago in the same period. No information regarding lead and zinc is obtainable, although use of the latter metal has run high all year.

To date there are no reports of new industries planned in Rochester.—G. B. E.

NEWARK, N. J.

OCTOBER 1, 1926.

Three radio manufacturing concerns are in financial straits and receivers have been appointed for each concern by the Federal and State Courts. Federal Judge Runyon declared the **R. E. Thompson Manufacturing Company** and the **R. E. Thompson Radio Corporation**, 66 York Street, Jersey City, insolvent and made permanent the receivership granted both firms several weeks ago. The court added Edward Maxson, state commissioner of banking and insurance, as permanent receiver with John Milton and Thomas K. Fitzgerald, both of whom acted as temporary receivers. Mr. Fitzgerald is an officer of the concerns.

T. Cyril Butler was appointed receiver for the **Merit Electric and Radio Corporation**, 933 Broad Street, Newark, by Federal Judge Runyon. The appointment followed the filing of involuntary petition in bankruptcy against the concern by the **Lincoln Electric and Supply Company**. Assets are placed at \$10,000 and liabilities in excess of that.

Following concerns have been incorporated: **Henry D. Dietz Company**, Newark, electrical supplies, \$100,000. **Lorber Brothers, Inc.**, Bloomfield, manufacture swivel keycases, etc.,

\$100,000 **Standard Electric Manufacturing Company**, Elizabeth, electrical appliances, \$10,000. **Socket Power Sales Company**, batteries, Newark, \$125,000. **American Safety Signal Corporation**, Newark, safety signals, \$40,000.—C. A. L.

TRENTON, N. J.

OCTOBER 1, 1926.

Business at the metal industry plants here is very good at the present time and some of the plants have enough orders on hand to keep them going for a good part of winter at least. The **Jordan L. Mott Company**, the largest concern of its kind here, is very busy and has been for some time. The **John A. Roebbing's Sons Company** is also busy, while hardware plants report a good volume of business.

Federal Judge Bodine has granted an injunction to the **Radio Corporation of America**, the **General Electric Company** and the **Westinghouse Electric and Manufacturing Company**, restraining the **Splitdorf Electrical Company**, a New Jersey corporation, from manufacturing and selling a selective tuning system used on radio receiving sets. An accounting of profits derived from the sale of tuning systems manufactured by the Splitdorf company in violation of the patent rights of the plaintiff companies was also ordered by Judge Bodine. The accounting is said to involve millions of dollars. The plaintiff companies claim to hold the exclusive rights of the tuning system as a result of a patent secured by Ernst F. W. Alexanderson, inventor, in 1913. The patent, it was claimed by the plaintiff companies, was sold to the General Company, which licensed the radio corporation to manufacture and sell it.

The **Electrical Industrial Laboratories, Inc.**, manufacturers of radio tubes, etc., must show cause why a receiver should not be appointed to liquidate its affairs. Vice Chancellor Church made an order to this effect on application of a creditor.

Following concerns were chartered here: **Arrow Manufacturing Company**, Hoboken, manufacture jewelry, \$120,000 preferred and 1,000 shares no par. **Draeco Electric, Inc.**, electrical devices, Trenton, 3,000 shares no par. **Aladdan Lamp, Inc.**, Newark, manufacture lamps, \$50,000 preferred and 1,000 shares no par.

Wright Metal Works, manufacture metal wares, Jersey City, \$100,000. **Kingston Brass Foundry Company**, Union City, manufacture brass, \$100,000.—C. A. L.

PITTSBURGH, PA.

OCTOBER 1, 1926.

Industrial activity in the metal fields, throughout Pittsburgh and western Pennsylvania, is reflected in the upward trend, although a few seasonal commodities are still more or less spotty.

Electrical equipment is moderately active, with radio equipment getting better. With the demand for radio equipment, on account of the season approaching, on the increase the

strong companies should show better earnings. Production of radiators and sanitary goods is at a fairly good rate.

Pittsburgh has experienced continued improvement in sales of machine tools, with export inquiry promising some substantial future orders. The call for miscellaneous shop equipment is better.

The outlook in the Hardware industry is characterized by wholesalers generally as encouraging, and it is expected that sales during the balance of 1926 will be well maintained. Building activities despite the recent recession, are expected to establish a record for the year, while the situation as it affects basic industries is highly satisfactory.—H. W. R.

MIDDLE WESTERN STATES

DETROIT, MICH.

OCTOBER 1, 1926.

No material change in the brass, copper and aluminum industry has taken place in this territory for a considerable time. It has followed the general trend of industrial conditions, which are admitted as fair to good. Most of the plants are operating, and as a rule, nearly up to capacity.

The automobile industry, which is one of the controlling factors, has not been as active during the summer as a year ago, and the outlook for the fall and summer is not all that could be expected; so it might be supposed there will be no great change in conditions for some time.

The American Standard Tool Works, Chicago, through F. C. Howard, of the Howard Foundry, Chicago, has purchased the factory building of A. E. McLintock, of Pontiac, and will establish a branch there. The foundry will turn out brass, aluminum and bronze castings, and manufacture wood and metal patterns, it is stated.

Frederick B. Stevens was recently elected grand lieutenant commander of the Ancient Scottish Rite of Free Masonry, at the closing session in Buffalo, N. Y. Mr. Stevens is prominent in the foundry industry in Detroit.

The Hackett Brass Foundry & Machine Shop, Detroit, has recently increased its capital stock from \$9,000 to \$26,000.

The McCord Radiator Manufacturing Company, Detroit, has declared its regular quarterly dividend of 75 cents on all class A stock payable on October to all stockholders of record on September 22.

A new valve, declared by its manufacturers to be immune to heat, warping, burning, or pitting, because of its unique hollow-head construction, is announced by the James Motor Valve Company, of Detroit. This valve, in addition to its self-cooling feature, is made from what is declared to be a remarkably efficient metal, "ni-chro-loy." Makers of this new valve point out that the present day cast iron valve scales at about 1,500 degrees Fahrenheit, warps at about the same temperature, and actually melts at 1,750 degrees. The valve temperature attained by high-grade cars, when operated at 40 miles an hour, is approximately 1,500 degrees, the point of scaling. The new valve will not warp nor melt below

3,000 degrees, the manufacturers point out, a heat impossible to obtain from present engine construction.—F. J. H.

CHICAGO, ILL.

OCTOBER 1, 1926.

The Service Tool Die and Manufacturing Company has increased stock from \$25,000 to \$100,000. Correspondents are Rieger and Rieger, 11 South La Salle street.

A charter has been granted Becker Brothers Electrical Corp., 23 North Jefferson street, to manufacture and deal in electrical machinery, attachments and appliances. Incorporators are William F. Becker, Charles J. Becker, Bruce F. Wallace. The correspondent is Becker Bros., Inc., 23-25 North Jefferson street.

The Wilson Electric Appliance Company, 134 S. La Salle street, with a capital of \$10,000, has been granted a charter to manufacture and deal in electrical appliances and machinery. The incorporators are Jerome J. Sladkey, Herbert S. Wilson, Ernest E. Lilliander. The correspondent is Urion, Drucker, Reichmann and Boutell, 134 S. La Salle street.

C. A. Engelbeck Corporation, 5115 Lake Park avenue, has been granted a charter, with a capital of \$30,000, to manufacture and deal in automotive vehicles, parts thereof, accessories, etc. Incorporators are C. A. Engelbeck, Leroy W. Stevens, H. S. Radenacher. The correspondent is Howe, Fordham and Kreamer, 7 South Dearborn street.

The Berry Manufacturing Company, 410 West Second street, Sparta, Ill., has been granted a charter to manufacture and deal in incubators, brooders, poultry supplies, etc. The company was capitalized at \$10,000. Incorporators are D. A. Berry, C. D. Reed, R. V. Morgan, G. A. Hood, W. Lynn. The correspondent is William M. Schuwert, Evansville.

Manufacturing jewelers of Chicago give reports of good business being done at the First Annual Jewelry and Allied Trades Show at the new Jewelers' building, held here last week. Under the direction of A. B. Coffman the show opened on September 20 and ended on September 24. The exhibits displayed goods sold by the jewelry trade. Dealers from all over the United States were in attendance.—L. H. G.

OTHER COUNTRIES

BIRMINGHAM, ENGLAND

SEPTEMBER 17, 1926

The metal works of Birmingham continue remarkably active, and there is very little to suggest that a coal stoppage is in operation throughout the country. Nearly all the Birmingham works use electricity for driving, and where heating is necessary the best use is made of gas. The most serious deficiency relates to coke, an essential for the production of such articles as condenser tubes. Great zeal has been found necessary in procuring coke of whatever quality, but by hook or by crook production has been maintained. To some extent oil furnaces have been introduced, and have worked efficiently as an emergency alternative. There is no probability, however, that they will be continued when coal becomes available, owing to the serious additions to working costs.

The brass trade in most branches maintains activity especially in the production of stamped goods. Nearly every description of domestic brass is maintaining its exports to Australia, Africa and India. South America is improving, but competition is severe with the United States and Germany.

A remarkable development has been the issue by a leading export merchant of circulars to their customers, pointing out that apparently business is being withheld owing to the impression that orders cannot be executed because of coal strike difficulties. This supposition, it is pointed out, is a mistake since in nearly all Birmingham products deliveries can be made very much as usual. The circular appears to have had a very good effect, as very few complaints of scarcity of orders for brass, copper, etc. are met with. The makers have every confidence that after the strike a busy period is awaiting the various branches of the trade.

The makers of gas and electrical household and office fittings are getting their usual seasonal demand, which is keeping the factories busy, and quite up to the usual activity. Unfortunately, the coal strike has affected manufacturers of plumbers' and builders' brass foundry, the shortage of fuel having partially arrested the supply of bricks for house building. A new rush of orders is looked for when building operations on the full scale of the last year or two are once more possible.

The improved orders for shipbuilding have brought some business to Birmingham, although the bulk would have been

very much larger but for the fact that so many yards find it impossible even to commence the laying down of keels through the lack of steel supplies from the steelworks. When shipbuilding demands become normal, there is every probability that the brass trades will have a very busy time.

The exports of aluminium hollow-ware for the seven months shows a decided increase being 1939 tons as against 1734 tons a year ago. This trade is undoubtedly growing, despite keen German competition. The Birmingham manufacturers very much regret the necessity to produce domestic aluminium of a lighter texture in order to meet German competition. But the export figures are considered to justify this policy, and further expansion is looked for. It is remarkable that Australia, which is one of the best customers of aluminium manufacturers, shows a strong preference for the heavier Birmingham goods, apparently valuing solidity and durability without too much regard for the selling price of the product. Great enterprise is being shown in anticipating the demands of the housewife, and the production of several hexagon shaped vessels such as saucepans and kettles, which can be closely fitted together over a gas stove, have proved popular, owing to the speedier

heating and greater economy in the use of gas, electricity, etc.

The electroplate trade is hardly up to its normal level, but there are signs of improvement, and some activity has resulted from better orders than usual from seaside retailers. The industry misses the business usually coming from hip-builders, and hotels have not been buying as freely as usual, a change which appears to have some connection with the coal strike.

Makers of galvanized hollow-ware have maintained production, though costs have been increased. Some of the leading makers believe that, by this time, a trade boom would have developed especially in connection with South America, but for the unfortunate industrial trouble.

In the hearth furniture trade business is better than at an time since the strike in May. The public preference is usually for oxidized silver, although Roman bronze is becoming more popular. Manufacturers report a steady demand from the Colonies where the immigrants from Britain retain a decided preference for the old fashioned house ware to which they have been accustomed. Colonial orders are substantial enough to furnish a most useful supplement to the home demand.—J. H.

Business Items—Verified

Magnuson Products Corporation, formerly of 415 3rd Avenue, Brooklyn, N. Y., have moved to 55 3rd street, Brooklyn, N. Y.

U. T. Hungerford Brass and Copper Company, New York, announces the removal of its Philadelphia warehouse to 46 North Sixth, corner Filbert street.

The **New Era Manufacturing Company**, Kalamazoo, Mich., manufacturer of self-lubricating metallic packing, babbitt and non-ferrous metal products, has changed its name to the **Durametallic Corporation**.

Lucius Pitkin, Inc., chemists and assayers, 47 Fulton street, New York, had a fire on September 30, due to a defective flue. The laboratories are being repaired and assaying is going on without interruption, as this department was not injured.

The **Newton Foundry Company**, Newton, Iowa, manufacturer of aluminum and light gray iron castings, has completed and now is operating its new 60 x 92-ft. addition. This firm operates the following departments: brass, bronze and aluminum foundry.

The **Ohio Brass Company**, Mansfield, Ohio, will build a five-story administration building, 52 x 255 ft. Bids will be taken shortly. This firm operates the following departments: brass foundry, brass machine shop, tool room, grinding room, galvanizing, plating, polishing.

The **Niagara Falls Smelting and Refining Corporation**, Buffalo, N. Y., is asking for bids for an addition to the main smelting plant, to be a steel structure, 100 x 50 ft. The company is also in the market for a briquetting machine for making metal compressors 4 x 4 x 11.

Leeds and Northrup Company, Philadelphia, Pa., has let contracts for a building which will be approximately 125' x 55' (four stories) and the cost will be in excess of \$200,000. This firm operates the following departments: brass machine shop, tool room, grinding room, plating, polishing, lacquering.

Detroit Lubricator Company, Detroit, Mich., has indefinitely postponed its building project, estimated to cost 50,000. This firm operates the following departments: smelting and refining, brass, bronze foundry; brass machine shop, tool room, grinding room, brazing, plating, japanning, stamping, tinning, soldering, polishing, lacquering.

The **Imperial Hardware Manufacturing Company**, 473 Hudson avenue, Brooklyn, N. Y., has leased the first floor of the plant of the **Majestic Metal Spinning Company**, 67 Navy street, and will establish a new works at this location. This firm operates the following departments: tool room, grinding room, plating, stamping, polishing, lacquering.

The **Hanson and Van Winkle Company**, Newark, N. J. has acquired the former plant of the **Atha Steel Works**, later the **Titan Steel Works** at the foot of Chapel street and Lister avenue. The structures will be remodeled for early occu-

pancy, primarily for heavy duty operations. **Van Winkle Todd** is president, and **Fred L. Hewitt**, vice-president.

The **Acme Stamping and Brass Works**, Zeeland, Mich., manufacturers of metal castings, have changed their name to the **West Michigan Brass Company**. This firm specializes in closet seat hinges and operates the following departments: brass foundry, aluminum foundry, brass machine shop, tool room, grinding room, plating, stamping, polishing, lacquering.

The **Zapon Company**, 247 Park Avenue, New York City, manufacturers of Zapon lacquers and lacquer enamels, announces the opening of a new sales office and warehouse at 547 Greenwich Street, New York City. This sales office and warehouse has been opened to facilitate service in the Metropolitan district. **H. W. McGovern**, who is well known in the metal, toy and doll industries, is in charge of this office and warehouse.

The **D. L. Auld Company**, East Fifth Avenue and Fifth street, Columbus, Ohio, manufacturer of metal name plates, has awarded a general contract to the **T. J. Schirtzinger Company**, 1535 North High street, for a one and two-story addition, 73 x 75 ft., estimated to cost \$40,000 with equipment. **S. G. Brook** is secretary and treasurer. This firm operates the following departments: tool room, grinding room, brazing, plating, stamping, soldering, polishing, lacquering.

The **Kirk & Blum Manufacturing Company** of Cincinnati, Ohio, designing engineers and manufacturers of pneumatic dust collecting, ventilating and conveying systems, announce the doubling of their plant facilities through the purchase of an adjoining factory. The need for larger space has arisen principally through the development of their "contract manufacturing" department, which is handling production of sheet metal parts for many manufacturers both in the North and South.

A portion of the plant of the **Hall Manufacturing Company**, 600-602 William street, Harrison, N. J., operating a nickel plating and kindred engineering supply works, was destroyed by fire August 11, with loss reported to be around \$60,000. Plans are being prepared for rebuilding. **Geo. C. Bartow** is the head of the company. The firm operates the following departments: brass, bronze and aluminum foundry; brass machine shop, tool room, grinding room, casting shop, spinning, galvanizing, plating, stamping, soldering, polishing, lacquering.

The **Central Brass Manufacturing Company**, and the **Paragon Brass Manufacturing Company**, Cleveland, Ohio, manufacturers of plumbers brass goods, have been merged under the name of the former company. The Central plant at 2950 E. 55th street is being enlarged to take care of the manufacture of products formerly made by the Paragon company. **E. A. Eckhouse**, president of the Central company, is at the

head of the combined organizations. This firm operates the following departments: brass foundry, brass machine shop, tool room, plating.

The **Bridgeport Brass Company** announces the appointment of **Hale J. Denny** as salesman of the Bridgeport line of tubular plumbing supplies, Bridgeport-Keating flush valves and Plumrite brass pipe in the Chicago office territory, which comprises ten Middle Western States. Mr. Denny, who will work under the direction of R. M. Hubler, Chicago district manager for the Bridgeport Brass Company, has been identified with the plumbing specialty line for about five years, soliciting orders for plumbing goods of all kinds from jobbers and manufacturers in the city of Chicago and the adjacent territory.

De Celles Bronze Company, Hartwick Building, Ferndale, Mich., is planning the erection of a new factory. This will be the finest industrial plant in Ferndale. The company will manufacture in bronze; tablets, plaques, statuary, urns, vases, memorials and a line of cemetery necessities on order

of purchasers. This firm will operate the following departments: bronze foundry, casting shop, spinning, polishing, lacquering, and will, no doubt, be in the market soon for equipment, such as lathes, pattern shop equipment, foundry equipment, polishing and buffing machines, lacquering or oxidizing equipment.

The **Bunting Brass and Bronze Company**, Toledo, Ohio, is pointed to as a model in safety education and practical results by the September issue of "The National Safety News" in a two-page article showing many views of the exterior and interior of the plant. The company has gone eight years without a fatal or permanently disabling accident to any of its 500 employees, even though metal furnaces, sand blasters and various machining processes make the industry hazardous without special safety precautions. This firm operates the following departments: brass, bronze foundry; brass machine shop, tool room, grinding room, casting shop, cutting-up shop, stamping, tinning, soldering, polishing.

Industrial and Financial News

INCORPORATIONS

The **Fretz Brass & Copper Company**, Philadelphia, Pa., has been formed by officials of the Fretz-Lex Brass & Copper Company, 826 Arch street, to take over and expand the present business. Application for state charter was made on September 13.

Keno Art Sign Company, 505 58th street, Kenosha, Wis., has been organized by H. T. Anderson and B. H. Hamersten of Chicago, to manufacture metal signs and art displays in quantities. The company is in the market for baking ovens and coating machines. This firm operates a stamping department.

The **Devon Metal Goods Company, Inc.**, Devon, Conn., has been incorporated with a capital stock of \$20,000, to manufacture metal garter trimmings, wire goods and metal stampings. The officers of the company are as follows: Anton C. Raffauf, president and general manager; Walter D. Grout, treasurer; Jacob Custuba, secretary. This firm will operate the following departments: tool room, cutting-up shop, plating, stamping.

Deemer Alloys Corporation, Wilmington, Del., founders of brass, bronze, aluminum and copper castings, was established recently. The company has been in operation since October 1, and equipment will be installed to make castings of all dimensions. F. J. Deemer, formerly works manager of the Deemer Steel Company, is president and general manager; W. S. Ferguson is secretary and treasurer and in charge of sales. Mr. Ferguson was previously connected with the American Manganese Steel Company.

DURALUMIN SEAPLANE

Great Britain has launched a new coastal flying boat which is the largest of all metal seagoing aircraft built in England.

The new craft, it is hoped, will mark a distinct advance in this type of coastal and long reconnaissance vessel. Its most striking new feature is its hull, which made of "duralium" (duralumin), a metal which its sponsors believe will supersede wood in such craft.—New York Times.

DURALUMIN SPEED BOAT

The first all metal speed boat, Cigarette IV, a 35-foot duralumin craft, designed by Frederick K. Lord and owned by L. Gordon Hamersley of 39 West Fifty-fifth Street and Port Washington, L. I., was launched at Port Washington yesterday. At a preliminary trial late in the afternoon in Manhasset Bay she showed such a burst of speed that her owner and designer believe she will make more than 70 miles per hour.

The hull is of duralumin throughout, not a splinter of wood being used in the construction. More than 4,000 sheets of the metal were used in the hull, fastened by 38,000 rivets and 5,000 bolts. After the boat was taken from the water early last evening

following her initial trial the mechanics could not find one rivet or bolt that had given, and there was not a drop of water leakage inside the hull.—New York Times.

AMMUNITION SALE

The Ordnance Department of the United States Army will shortly offer approximately 3,000,000 pounds of unserviceable smokeless powder in exchange for either propellant powder of current manufacture or strip brass, to be used in the manufacture and assembly of new ammunition.

This unserviceable powder is of the single-base type, being an ether-alcohol colloid of nitrocellulose of 12.60 per cent nitrogen content with 0.5 per cent diphenylamine added as a stabilizer. The nitrocellulose when recovered from the powder and purified becomes the basic material for the manufacture of nitrocellulose lacquers and various pyroxylin products.

The unserviceable powder is at present stored at Picatinny Arsenal, Dover, New Jersey, and that establishment will be in charge of effecting the exchange of this powder.

WESTINGHOUSE REORGANIZATION

Reorganization of the General Engineering Department of the Westinghouse Electric and Manufacturing Company has been announced by H. W. Cope, assistant director of engineering.

The reorganization has necessitated the reallocation of several engineers, four being elevated to managers of engineering. These are F. C. Harker, manager of Central Station Engineering; S. B. Cooper, manager of Railway Engineering; G. E. Stoltz, manager of Industrial Engineering, and W. E. Thau, manager of Marine Engineering. S. A. Staeger, formerly section engineer in charge of the paper mill section, has been appointed industrial engineer, giving particular attention to the paper mill industry.

Other appointments, also announced by Mr. Cope, are:

Central Station Engineering—C. A. Powel, engineer, Generating Station Engineering; R. D. Evans, engineer, Transmission Engineering, and C. A. Butcher, engineer, Substation Engineering.

Railway Engineering—H. K. Smith, engineer, Heavy Traction Engineering; G. M. Woods, engineer, Light Traction Engineering, and A. H. Candee, engineer, Gas-Electric Traction Engineering.

Industrial Engineering—E. M. Bouton, engineer, Elevator Engineering; C. W. Drake, engineer, General Industrial Engineering; C. T. Guildford, engineer, Textile Engineering; C. H. Matthews, engineer, Mining Engineering; O. Needham, engineer, Steel Mill Engineering; J. W. Speer, engineer, Material Handling Engineering; W. W. Spratt, engineer, Paper Mill Engineering, and E. B. Dawson, engineer, Electrochemical and Electrometallurgical Engineering.

The appointment of N. W. Storer as consulting railway engineer in charge of the group handling the Diesel-electric locomotives and rail cars has been announced by R. S. Feicht, director of engineering.

DURALUMIN AIRPLANE PROPELLER

The largest airplane propeller in the world, made of aluminum alloy, has recently been given the finishing touches by workmen of the **Standard Steel Propeller Company**, 7812-14 Hamilton avenue, Pittsburgh, Pa., before being shipped to the McCook field Dayton, Ohio. The three-blade propeller is of the type used by the navy on seaplanes and the two-blade product is for the army pursuit planes. The propeller measures sixteen feet from tip to tip.

There have been wooden propellers made in this size, but the practical features of the aluminum blade as discovered through the use of smaller sizes, caused the army authorities to order the larger product.

The propeller is made of solid special aluminum alloy forging, except the hub, which is made of chrome vanadium heat-treated steel.

The 16-foot blade is manufactured in sections. Two blades of eight feet each are inserted in a patent lock within the steel hub and then again securely locked outside by a steel band. This permits the repairs of a propeller at any landing place by the insertion of one or more blades without removing the propeller from the plane.

The advantage of the disconnected propeller with the aluminum blades has been so well recognized by the army and navy departments that the Pittsburgh plant of the **Standard Steel Propeller Company** is working full time to produce for these two agencies.

The company also manufactures three-blade propellers, which are used exclusively by the navy for seaplanes, and small two-blade propellers for special army planes.

The company was first known as the **Dicks-Luttrell Propeller Company**, having been organized in May, 1918. This concern engaged in the experimentation and development of blades and hubs, and on January 2, 1919, was taken over by the **Standard Steel Propeller Company**, its plant being located at 915 North Murland street. This company for six years has been working on intensive experimentation in conjunction with different army and navy flying fields, and testing stations throughout the United States.

The blades were designed by F. W. Caldwell, chief of propeller branch, McCook field, Dayton, Ohio, and the hub by Thomas A. Dicks, of the **Standard Steel Propeller Company**.

The officers of the local company are: Harry A. Kraeling, president; John M. Harvey, vice-president; Henry B. Kearney, secretary; William Ganley, treasurer. Directors are: Kraeling, Harvey, Samuel E. Diescher, Joseph A. Kelly, Thomas A. Dicks, A. A. Reiseman and Kearney.

INCREASED PRODUCTION OF SECONDARY METALS IN 1925

The recovery of certain metals from secondary sources in 1925 is reported to the Bureau of Mines, Department of Commerce, as valued at \$243,570,700, which is \$42,990,100 more than in 1924. The increase in the value of all metals, according to J. P. Dunlop, who compiled the figures, was due both to larger quantities of several kinds recovered and to higher average prices of all the

tinned. Nearly 25 pounds of tin was recovered per ton of cans and about 34 pounds per ton of tin-plate clippings.

Secondary antimony increased more than 1,400 tons and the value was 87 per cent over 1924. The recovery of secondary aluminum showed the very large increase in 1925, of 7,350 tons, and that in alloys, mainly No. 12, increased nearly 10,000 tons.

Secondary metals of certain classes recovered in the United States in 1924 and 1925

	1924		1925	
	Short tons	Value	Short tons	Value
Copper, including that in alloys other than brass.....	196,500	\$51,483,000	250,600	\$71,170,400
Brass scrap remelted.....	274,000	58,444,200	242,300	56,270,800
Lead as metal.....	90,400	32,720,000	112,420	39,477,100
Lead as alloys.....	114,100		114,460	
Zinc as metal.....	58,886	9,020,000	61,430	11,359,000
Zinc in alloys other than in brass and in chemical compounds.....	10,500		13,300	
Tin as metal.....	7,700	31,062,100	7,950	35,165,400
Tin in alloys and chemical compounds.....	23,600		23,000	
Antimony as metal.....	90	2,025,600	1	3,794,000
Antimony in alloys.....	9,314		10,839	
Aluminum as metal.....	10,350	14,596,200	17,700	24,816,000
Aluminum in alloys.....	16,650		26,300	
Nickel as metal.....	114	1,227,500	191	1,518,000
Nickel in nonferrous alloys and salts.....	2,126		2,109	
		\$200,578,600		\$243,570,700

metals in 1925. Although the statistics indicated a decline in brass, this is more apparent than actual owing to a better classification of alloys, which increased the quantity of bronze and other alloys containing copper. The quantity of scrap copper treated at regular refineries treating ore showed an increase of about 21,800 tons, and that treated at secondary smelters and used by foundries increased more than 20,400 tons. The copper in alloys other than brass showed an increase of nearly 12,000 tons, while the copper content of brass recovered decreased 22,200 tons. Lead in alloys in 1925 apparently was about the same as in 1924, but secondary pig lead increased about 22,000 tons. Zinc recovered by redistillation, sweating and remelting increased over 2,500 tons, entirely owing to an increase of about 4,000 tons of redistilled zinc. There was an increase of nearly one-third in the quantity of zinc in alloys other than brass. In addition to the recoveries of zinc as metal and in alloys, large quantities of zinc dross and skimmings are used for lithopone, zinc dust, zinc sulphate, and zinc chloride. The recoveries of tin were about the same in 1925 as in 1924, but the value was considerably higher in 1925. The quantity of tin-plate clippings treated in 1925 increased about 6,000 long tons and more than 1,000 long tons of old tin cans were de-

METAL STOCK MARKET QUOTATIONS

	Par	Bid	Asked
Aluminum Company of America.....	..	\$70	\$72
American Hardware Corporation.....	\$100	86	88
Anaconda Copper.....	50	48½	48¾
Bristol Brass.....	25	4	7
International Nickel, com.....	25	35¾	35¾
International Nickel, pfd.....	100	103	..
International Silver, com.....	100	94½	97
International Silver, pfd.....	100	105	107
National Enameling & Stamping.....	100	25½	26¾
National Enameling & Stamping, pfd.....	100	80	82
National Lead Company, com.....	100	146	148
National Lead Company, pfd.....	100	116	116¾
New Jersey Zinc.....	100	184	186
Rome Brass & Copper.....	100	138	148
Scovill Manufacturing Company.....	..	240	245
Yale & Towne Mfg. Company, new.....	..	68¾	70

Corrected by J. K. Rice, Jr., Co., 120 Broadway, New York.

FEDERATED METALS LOSS

The Federated Metals Corporation, with headquarters in Chicago, Ill., reports for the six months ended May 31, 1926, a net loss

after readjustment of inventory, interest and all other charges, except depreciation, of \$626,903. Net sales were \$29,474,130. Net current assets as of May 31 were \$7,692,272.—New York Times.

Review of the Wrought Metal Business

Written for The Metal Industry by J. J. WHITEHEAD, President of the Whitehead Metal Products Company of New York, Inc.

OCTOBER 1, 1926.

There were no changes of any importance in September in the fabricating end of the metal industry including the red, yellow and white metal alloys. The factor which influences the situation to the greatest degree at the present time is the condition of the refrigerator business. This line has reached a point of such great importance in the consumption of copper and Monel metal that its ups and downs are promptly reflected in almost every branch of non-ferrous production. It appears that there has not been any resumption of activity in the production of ice machines on a scale sufficiently large to cause the manufacturers to enter the market for new purchases or to call for the release of any of the contracts which were held up when production was suspended in late July. The ice machine people have been going ahead with manufacturing in a moderate way during September, but for the most part they have been working on stocks which they had accumulated up to the time they curtailed their activities a couple of months ago. There is no doubt that the withdrawal of orders by the ice machine people has left a big hole in the order books of the brass manufacturers.

Other lines are fairly active but productive capacity is sufficiently large to take care of them easily and there is no difficulty in getting prompt deliveries. The mills are comfortably fixed for orders, even though they have no large backlog. It is expected that the ice machine demand will resume in another month and when it does there will be enough tonnage placed to fill the order books and slow up deliveries again.

No new developments of any great significance have been noted. The building activity continues to absorb quantities of brass pipe and sheet copper. In the suburban building operations, even those which are of a speculative character, there is a very definite trend toward the use of brass pipe for plumbing. A couple of years ago nearly all the builders adopted copper leaders and gutters for their houses and now they have taken another step forward by installing brass pipe and advertising the fact very extensively.

The white metals such as nickel, nickel silver and Monel metal have enjoyed a continuation of the demand heretofore reported and producers are pleased with the conditions in this branch of the industry. Architects on many of the large department houses have been specifying Monel metal pantry sinks. The new Ritz Towers has something more than 300 of these pantry sinks installed. They possess the advantage of added beauty and are easy to keep bright and clean. Also they occupy much less space than the enamel sinks of a corresponding capacity. The Berkshire Mills of Reading, Pa., recently renovated their dyeing equipment and installed a number of new dyeing machines. The new equipment was made almost entirely of Monel metal and a number of tons of this metal were consumed in the new construction work.

Caution is still the prevailing watchword throughout the industry. With stocks all at a low level and buying still in hand to mouth style, the fundamental basis is healthy and any increase in purchasing activity will result in clogging the mills with orders. No one seems to fear any depression in the near future.

Metal Market Review

Written for The Metal Industry by R. J. HOUSTON, of D. Houston & Company, Inc., Metal Brokers, New York

OCTOBER 1, 1926.

COPPER

Volume of trade in copper last month was on a substantial scale, and the position of the market here is not greatly changed from that of a few weeks ago. Foreign quotations were characterized by more or less weakness. London cables showed a decline of £1 per ton in September, but despite the easier foreign position the undertone of the domestic market was maintained, for the most part, at 14¼c @ 14¾c basis.

For many months domestic shipments and exports of refined copper were in excess of output. But the August movements showed 3,436,000 pounds unabsorbed product and an increase of stocks to that extent. Deliveries for that month were the largest of the year, with the exception of the shipments in March. Total deliveries for the first 8 months of the year, however, exceeded output by 12,848,000 pounds, so that the situation is in hopeful shape. Much interest centers in the prospective operations of the Copper Export Association. It is expected to pursue a conservative and stabilizing policy of far reaching influence of definite benefit to both producers and consumers.

ZINC

Sales were in good volume during recent weeks, but much of the business was secured by making concessions. Considerable selling pressure was a feature at time, and the eagerness to sell sent the East St. Louis quotation to 7.37½c for Prime Western. A shade below that figure was heard of for December shipment. The New York price is quoted at 7.72½c, and compares with 7.80c a few weeks ago. Consumption is large at present, and will presumably remain so for the balance of the year. The statistical position is also sound as evidenced by a reduction in stocks of 4,822 tons during August. The amount at the end of August in smelters' hands was only 18,164 tons. Production in August amounted to 51,761 tons and total deliveries to 56,583 tons.

TIN

The market for tin scored successive advances lately due to the strong position of the article and the bullish attitude of the leading operators. Nearby deliveries sold up to 71c around the middle of September, but selling pressure developed at that level and prices receded. There were frequent reactions and rallies, but with every indication that a period of real stringency exists. The acute situation may continue for some time. The law of supply and demand has operated in favor of high prices, but it is doubtful if the present abnormal values can be maintained indefinitely. American deliveries for September were 5,835 tons, compared with 5,870 tons in August. Total United States deliveries for the first 9 months of 1926 amounted to 59,450 tons, against 58,555 tons for the corresponding period in 1925, an increase of 895 tons. There was a sharp advance in prices at both London and New York on October 1, with heavy sales abroad. October Straits was quoted at 69½c @ 70c and the December position about 2 cents below those figures. Spot metal was at a premium.

LEAD

Easier market conditions and lower prices developed in September. There was a fairly good demand after a reduction in price to 8.75c New York basis. Consumers showed moderate interest in prompt shipment, but were inclined to defer covering future needs until the market manifested a more definite trend. There is a large consumption of the metal, and there is every prospect that the market will emerge from its dullness as fourth quarter requirements became more urgent. Producers are not loaded up with heavy stocks according to current belief. A change in sentiment would soon result in a large increase of sales.

ALUMINUM

Consumption of aluminum in large volume has been consistently maintained for many months. Requirements of the automotive

industry are at a high rate and prospects are good for the final quarter of the year. Production and imports are keeping up with the demand, but there are no indications of an abnormal increase of stocks. Material is held in warehouses against orders, but this method is followed to keep shipments moving on schedule. Prices show remarkable stability at 27c for 99% plus ingot and 26c for the metallurgical grade of 94-99%. Imports of foreign aluminum into the United States during the first seven months of this year amounted to 43,100,385 pounds as compared with 13,813,107 pounds in the corresponding months of 1925. English producers were reported to have reduced the price to £107 for home consumption and to £112 for export. The reduction has been without any apparent price influence here.

ANTIMONY

Conditions in China have assumed a more serious aspect recently, but notwithstanding of that fact antimony prices have shown a downward tendency. Recent sales of Chinese regulus were made at 13½c and 13¼c duty paid for nearby and forward deliveries. A firmer tone prevailed subsequently and prompt deliveries were held at 14c duty paid. Consumers have been comfortably covered on immediate requirements, but with the Chinese situation in a state of tension, the market could easily develop more active and former tendencies on short notice. The high point this year was 25c and the low 9½c. The present price cannot be considered high compared with former market quotations, but the course of the market depends upon future developments in China.

QUICKSILVER

Producers and importers have been getting higher prices for quicksilver lately. Demand has been more active, and the shipment position is reported as a firm one. Present quotations are \$93.50 to \$94 per flask, with firm market tendency.

PLATINUM

The market for platinum quotes \$113 @ \$115 for refined metal. Recent demand was on a satisfactory scale for usual quantities.

SILVER

Silver markets have suffered a severe slump recently. During the last half of September the metal experienced the worst break

in many years, when a price of 56½c was made on September 30. There was a slight rally October 1 to 57½c, but the outlook remains unsettled. There has been an accumulation of large stocks in Far Eastern centers. Holdings in Shanghai and India are enormous, and selling from those quarters has greatly disturbed all world markets. The proposed change in the monetary system of India from a silver to a gold basis is the underlying reason for the present demoralization of the white metal. Chinese selling was in enormous volume in addition to bear speculation by Indian traders, and this action depressed prices to the lowest point in years. New York and London was called upon to absorb the large offerings. The situation is unsettled and presents new problems of far reaching moment. There is reason to believe, however, that India and China will continue to use huge quantities of silver in the future.

OLD METALS

The outlook for scrap metals continues in good volume. Consumers have been taking supplies at a fairly steady rate, but recent new business was reported, as comparatively quiet. Buyers display caution in placing orders. In some quarters prices were slightly lower owing to failure of some of the new metals to advance. Aluminum scrap has been moving in good volume at full prices. The export demand was quiet recently, buyers views being below the domestic range of prices. Prices quoted by dealers were: 11½c for heavy copper, 9½c for light copper scrap, 7c@7¼c for heavy brass scrap 9½c@9¾ for new brass clippings, 7c@7¼c for heavy lead, 4c@4¼c for old zinc, and 21c@21½c for aluminum clippings.

WATERBURY AVERAGE

Lake Copper—Average for 1925, 14.427—January, 1926, 14.25c.—February, 14½c.—March, 14.25c.—April, 14.125c.—May, 14.00c.—June, 14.00c.—July, 14.25c.—August, 14.50c.—September, 14.50c.

Brass Mill Zinc—Average for 1925, 8.263—January, 1926, 9.00c.—February, 8.20c.—March, 7.80c.—April, 7.45c.—May, 7.20c.—June, 7.55c.—July, 7.80c.—August, 7.80c.—September, 7.85c.

Daily Metal Prices for the Month of September, 1926

Record of Daily, Highest, Lowest and Average Prices and the Customs Duties

	1	2	3	6*	7	8	9	10	13	14	15	16	17
Copper (f. o. b. Ref.) c/lb. Duty Free													
Lake (Delivered)	14.50	14.50	14.50	.....	14.50	14.50	14.50	14.50	14.50	14.50	14.45	14.45	14.45
Electrolytic	14.30	14.25	14.25	.....	14.25	14.25	14.20	14.20	14.20	14.20	14.20	14.20	14.20
Casting	13.95	13.90	13.90	.....	13.90	13.90	13.85	13.85	13.85	13.85	13.85	13.85	13.85
Zinc (f. o. b. St. L.) c/lb. Duty 1¼c/lb.													
Prime Western	7.425	7.425	7.425	.....	7.425	7.425	7.40	7.45	7.50	7.475	7.475	7.475	7.475
Brass Special	7.475	7.475	7.475	.....	7.475	7.50	7.50	7.525	7.575	7.55	7.55	7.55	7.55
Tin (f. o. b., N. Y.) c/lb. Duty Free													
Straits	66.125	65.875	66.125	.....	67.25	67.625	67.875	68.25	69.25	68.875	69.75	71.00	70.25
Pig 99%	64.125	63.875	64.00	.....	65.125	65.50	65.50	66.00	67.125	66.75	67.50	68.625	67.75
Lead (f. o. b. St. L.) c/lb. Duty ¾c/lb.													
.....	8.65	8.65	8.65	.....	8.65	8.625	8.60	8.60	8.50	8.50	8.50	8.50	8.50
Aluminum c/lb. Duty 5c/lb.													
.....	28	27	27	.....	27	27	27	27	27	27	27	27	27
Nickel c/lb. Duty 3c/lb.													
Ingot	35	35	35	.....	35	35	35	35	35	35	35	35	35
Shot	36	36	36	.....	36	36	36	36	36	36	36	36	36
Electrolytic	39	39	39	.....	39	39	39	39	39	39	39	39	39
Antimony (J. & Ch.) c/lb. Duty 2c/lb.													
.....	15.75	16.00	16.00	.....	16.00	16.00	16.00	16.25	16.50	16.50	16.50	16.00	15.75
Silver c/oz. Troy Duty Free													
.....	62.25	62.25	62.00	.....	61.50	61.50	61.75	61.75	61.75	61.625	61.375	61.375	61.25
Platinum \$/oz. Troy Duty Free													
.....	113	113	113	.....	113	113	115	115	115	115	115	115	115
	20	21	22	23	24	27	28	29	30	High	Low	Aver.	
Copper (f. o. b. Ref.) c/lb. Duty Free													
Lake (Delivered)	14.45	14.45	14.40	14.375	14.375	14.375	14.375	14.375	14.375	14.375	14.50	14.375	14.448
Electrolytic	14.20	14.20	14.15	14.10	14.05	14.10	14.125	14.15	14.15	14.15	14.30	14.05	14.187
Casting	13.85	13.85	13.80	13.75	13.70	13.75	13.80	13.80	13.80	13.80	13.95	13.70	13.838
Zinc (f. o. b. St. L.) c/lb. Duty 1¼c/lb.													
Prime Western	7.475	7.45	7.40	7.375	7.375	7.40	7.40	7.40	7.375	7.50	7.375	7.430	
Brass Special	7.50	7.50	7.45	7.425	7.425	7.425	7.45	7.45	7.425	7.575	7.425	7.488	
Tin (f. o. b., N. Y.) c/lb. Duty Free													
Straits	70.25	69.75	69.125	69.375	69.375	70.50	71.00	70.25	69.50	71.00	65.875	68.923	
Pig 99%	67.625	67.50	66.875	67.25	67.25	68.00	68.25	68.00	67.25	68.625	63.875	66.661	
Lead (f. o. b. St. L.) c/lb. Duty ¾c/lb.													
.....	8.50	8.50	8.50	8.45	8.45	8.45	8.45	8.45	8.40	8.40	8.65	8.40	8.527
Aluminum c/lb. Duty 5c/lb.													
.....	27	27	27	27	27	27	27	27	27	27	28	27	27.048
Nickel c/lb. Duty 3c/lb.													
Ingot	35	35	35	35	35	35	35	35	35	35	35	35	35
Shot	36	36	36	36	36	36	36	36	36	36	36	36	36
Electrolytic	39	39	39	39	39	39	39	39	39	39	39	39	39
Antimony (J. & Ch.) c/lb. Duty 2c/lb.													
.....	15.25	15.00	15.00	14.50	14.50	14.25	14.00	14.00	14.00	16.50	14.00	15.417	
Silver c/oz. Troy Duty Free													
.....	60.50	60.50	60.375	60.00	59.125	58.125	58.00	57.375	56.875	62.25	56.875	60.536	
Platinum \$/oz. Troy Duty Free													
.....	115	115	115	115	115	115	115	115	115	115	113	114.524	

*Holiday.

Metal Prices, October 11, 1926

NEW METALS

Copper: Lake, 14.25. Electrolytic, 14.05. Casting, 13.70.
Zinc: Prime Western, 7.325. Brass Special, 7.375.
Tin: Straits, 71.00. Pig, 99%, 69.00.
Lead: 8.25. Aluminum, 27.00. Antimony, 14.50.

Nickel: Ingot, 35. Shot, 36. Elec., 39. Pellets, 40.
Quicksilver: flask, 75 lbs., \$94.00. Bismuth, \$2.70 to \$2.75.
Cadmium, 60. Cobalt, 97%, \$2.60. Silver, oz., Troy, 55.75.
Gold, oz., Troy, \$20.67. Platinum, oz., Troy, \$110.00.

INGOT METALS AND ALLOYS

Brass Ingots, Yellow	10½ to 12½
Brass Ingots, Red	12¼ to 13½
Bronze Ingots	12 to 13
Casting Aluminum Alloys	21 to 24
Manganese Bronze Castings	24 to 42
Manganese Bronze Ingots	13½ to 17
Manganese Bronze Forging	34 to 42
Manganese Copper, 30%	25 to 35
Monel Metal Shot	32
Monel Metal Blocks	32
Parsons Manganese Bronze Ingots	18¼ to 19¼
Phosphor Bronze	13½ to 15
Phosphor Copper, guaranteed 15%	18½ to 22½
Phosphor Copper, guaranteed 10%	18 to 21½
Phosphor Tin, guaranteed 5%	70 to 80
Phosphor Tin, no guarantee	70 to 80
Silicon Copper, 10%	25 to 35

OLD METALS

Buying Prices		Selling Prices	
11¼ to 12¼	Heavy Cut Copper	13¼ to 13¾	
11½ to 12	Copper Wire	13 to 13¾	
10¼ to 10¾	Light Copper	11½ to 11¾	
9¼ to 9½	Heavy Machine Composition	10¾ to 11	
7¾ to 8	Heavy Brass	9 to 9¼	
6¾ to 7	Light Brass	8 to 8¼	
7¾ to 8¼	No. 1 Yellow Brass Turnings	9½ to 10	
8¾ to 9¼	No. 1 Composition Turnings	10½ to 11	
7½ to 7¾	Heavy Lead	8¼ to 8½	
5 to 5¼	Zinc Scrap	6 to 6¼	
12 to 13	Scrap Aluminum Turnings	15 to 17	
16½ to 18	Scrap Aluminum, cast alloyed	20 to 21	
22½ to 23	Scrap Aluminum, sheet (new)	24 to 25½	
38 to 40	No. 1 Pewter	42 to 44	
12	Old Nickel Anodes	14	
18	Old Nickel	20	

Wrought Metals and Alloys

COPPER SHEET

Mill shipments (hot rolled)	22c. to 23c. net base
From stock	23c. to 24c. net base

BARE COPPER WIRE

16½c. to 16¾c. net base, in carload lots.

COPPER SEAMLESS TUBING

25c. to 26c. net base.

SOLDERING COPPERS

300 lbs. and over in one order	21½c. net base
100 lbs. to 200 lbs. in one order	22 c. net base

ZINC SHEET

Duty, sheet, 15%	Cents per lb.
Carload lots, standard sizes and gauges, at mill, less 8 per cent discount	11.75 net base
Casks, jobbers' price	13.00 net base
Open Casks, jobbers' price	13.50 to 13.75 net base

ALUMINUM SHEET AND COIL

Aluminum sheet, 18 ga., base price	40c.
Aluminum coils, 24 ga., base price	36.70c.
Foreign	40c.

ROLLED NICKEL SHEET AND ROD

Net Base Prices

Cold Drawn Rods	58c.	Cold Rolled Sheet	60c.
Hot Rolled Rods	50c.	Hot Rolled Sheet	52c.

BLOCK TIN SHEET

Block Tin Sheet—18" wide or less. No. 26 B. & S. Gauge or thicker, 100 lbs. or more, 10c. over Pig Tin; 50 to 100 lbs., 15c. over; 25 to 50 lbs., 17c. over; less than 25 lbs., 25c. over.

SILVER SHEET

Rolled sterling silver, 58½ to 60½c.

BRASS MATERIAL—MILL SHIPMENTS

In effect August 3, 1926

To customers who buy 5,000 lbs. or more in one order.

	Net base per lb.		
	High Brass	Low Brass	Bronze
Sheet	\$0.19¾	\$0.20¾	\$0.22¾
Wire .....	.19¾	.21¾	.23¾
Rod .....	.17¾	.21¾	.23¾
Brazed tubing .....	.27¾	.....	.32¾
Open seam tubing .....	.27¾	.....	.32¾
Angles and channels .....	.30¾	.....	.35¾

For less than 5,000 lbs. add 1c. per lb. to above prices.

BRASS SEAMLESS TUBING

24¼c. to 25¼c. net base.

TOBIN BRONZE AND MUNTZ METAL

Tobin Bronze Rod	21¾c. net base
Muntz or Yellow Metal Sheathing (14"x48")	19¾c. net base
Muntz or Yellow Rectangular sheet other Sheathing	20¾c. net base
Muntz or Yellow Metal Rod	17¾c. net base

Above are for 100 lbs. or more in one order.

NICKEL SILVER (NICKELENE)

Net Base Prices

Grade "A" Sheet Metal		Wire and Rod	
10% Quality	27¼c.	10% Quality	30¼c.
15% "	28¾c.	15% "	34 c.
18% "	30 c.	18% "	37¼c.

MONEL METAL SHEET AND ROD

Hot Rolled Rods (base)	35	Hot Rolled Sheets (base)	42
Cold Drawn Rods (base)	43	Cold Rolled Sheets (base)	50

BRITANNIA METAL SHEET

No. 1 Britannia—18" wide or less, No. 26 B. & S. Gauge or thicker, 500 lbs. or over, 8c. over N. Y. tin price; 100 lbs. to 500 lbs., 10c. over; 50 to 100 lbs., 15c. over; 25 to 50 lbs., 20c. over; less than 25 lbs., 25c. over. Prices f. o. b. mill.

Supply Prices, October 11, 1926

ANODES

Copper: Cast	22c. per lb.	Nickel: 90-92%	45c. per lb.
Rolled	21½c. per lb.	95-97%	47c. per lb.
Electrolytic	19½c. per lb.	99%	49c. per lb.
Brass: Cast	21c. per lb.	Silver: Rolled silver anodes .999 fine are quoted from 65¾c.	
Rolled	21½c. per lb.	to 67¾c. per Troy ounce, depending upon quantity	
Zinc: Cast	14c. per lb.	purchased.	

FELT POLISHING WHEELS WHITE SPANISH

Diameter	Thickness	Under 100 lbs.	100 to 200 lbs.	Over 200 lbs.
10-12-14 & 16"	1" to 3"	\$3.00/lb.	\$2.75/lb.	\$2.65/lb.
6-8 & over 16	1 to 3	3.10	2.85	2.75
6 to 24	Under ½	4.25	4.00	3.90
6 to 24	½ to 1	4.00	3.75	3.65
6 to 24	Over 3	3.40	3.15	3.05
4 up to 6	¼ to 3	4.85	4.85	4.85
4 up to 6	Over 3	5.25	5.25	5.25
Under 4	¼ to 3	5.45	5.45	5.45
Under 4	Over 3	5.85	5.85	5.85

Grey Mexican Wheel deduct 10c per lb. from White Spanish prices.

COTTON BUFFS

Full Disc Open buffs, per 100 sections.	
12" 20 ply 64/68 Unbleached	\$30.35-31.00
14" 20 ply 64/68 Unbleached	38.20-38.55
12" 20 ply 80/92 Unbleached	32.45
14" 20 ply 80/92 Unbleached	44.00
12" 20 ply 84/92 Unbleached	37.15-42.85
14" 20 ply 84/92 Unbleached	50.40-57.40
12" 20 ply 80/84 Unbleached	37.75-38.90
14" 20 ply 80/84 Unbleached	51.20-52.40

Sewed Pieced Buffs, per lb., bleached 65-75c.

CHEMICALS

These are manufacturers' quantity prices and based on delivery from New York City.

Acetone	lb.	.12-.16	Lead Acetate (Sugar of Lead)	lb.	.13¾
Acid—Boric (Boracic) Crystals	lb.	.12	Yellow Oxide (Litharge)	lb.	.12¾
Hydrochloric (Muriatic) Tech., 20°, Carboys	lb.	.02	Mercury Bichloride (Corrosive Sublimate)	lb.	\$1.21
Hydrochloric, C. P., 20 deg., carboys	lb.	.06	Nickel—Carbonate dry, bbls.	lb.	.29
Hydrofluoric, 30%, bbls.	lb.	.08	Chloride, bbls.	lb.	.18-.21
Nitric, 36 deg., carboys	lb.	.06	Salts, single 300 lb. bbls.	lb.	.10½
Nitric, 42 deg., carboys	lb.	.07	Salts, double 425 lb. bbls.	lb.	.10
Sulphuric, 66 deg., carboys	lb.	.02	Paraffin	lb.	.05-.06
Alcohol—Butyl	lb.	.19-23½	Phosphorus—Duty free, according to quantity	lb.	.35-.40
Denatured, bbls.	gal.	.45	Potash, Caustic Electrolytic 88-92% broken, drums ..	lb.	.09¾
Alum—Lump, Barrels	lb.	.03¾	Potassium Bichromate, casks (crystals)	lb.	.08½
Powdered, Barrels	lb.	.042	Carbonate, 96-98%	lb.	.07
Aluminum sulphate, commercial tech.	lb.	.02¾	Cyanide, 165 lb. cases, 94-96%	lb.	.57½
Aluminum chloride solution in carboys	lb.	.06½	Pumice, ground, bbls.	lb.	.02½
Ammonium—Sulphate, tech. bbls.	lb.	.03¾	Quartz, powdered	ton	\$30.00
Sulphocyanide	lb.	.65	Rosin, bbls.	lb.	.04½
Arsenic, white, kegs	lb.	.05	Pouge, nickel, 100 lb. lots	lb.	.25
Asphaltum	lb.	.35	Silver and Gold	lb.	.65
Benzol, pure	gal.	.60	Sal Ammoniac (Ammonium Chloride) in casks ..	lb.	.06
Borax Crystals (Sodium Biborate), bbls.	lb.	.05½	Silver Chloride, dry	oz.	.86
Calcium Carbonate (Precipitated Chalk)	lb.	.04	Cyanide	oz.	.62
Carbon Bisulphide, Drums	lb.	.06	Nitrate, 100 ounce lots	oz.	.44½
Chrome Green, bbls.	lb.	.29	Soda Ash, 58%, bbls.	lb.	.02½
Copper—Acetate (Verdegris)	lb.	.37	Sodium—Cyanide, 96 to 98%, 100 lbs.	lb.	.20
Carbonate, bbls.	lb.	.17	Hypsulphite, kegs	lb.	.04
Cyanide (100 lb. kegs)	lb.	.50	Nitrate, tech., bbls.	lb.	.04¾
Sulphate, bbls.	lb.	.05½	Phosphate, tech., bbls.	lb.	.03¾
Cream of Tartar Crystals (Potassium bitartrate) ..	lb.	.27	Silicate (Water Glass), bbls.	lb.	.02
Crocus	lb.	.15	Sulpho Cyanide	lb.	.45
Dextrin	lb.	.05-.08	Sulphur (Brimstone), bbls.	lb.	.02
Emery Flour	lb.	.06	Tin Chloride, 100 lb. kegs	lb.	.48½
Flint, powdered	ton	\$30.00	Tripoli, Powdered	lb.	.03
Fluor-spar (Calcic fluoride)	ton	\$75.00	Wax—Bees, white ref. bleached	lb.	.60
Fusel Oil	gal.	\$4.45	Yellow, No. 1	lb.	.45
Gold Chloride	oz.	\$14.00	Whiting, Bolted	lb.	.02½-.06
Gum—Sandarac	lb.	.26	Zinc, Carbonate, bbls.	lb.	.11-.12
Shellac	lb.	.59-.61	Chloride, casks	lb.	.07
Iron, Sulphate (Copperas), bbl.	lb.	.01½	Cyanide (100 lb. kegs)	lb.	.41
			Sulphate, bbls.	lb.	.03½